

Australian **ELECTRONICS ENGINEERING**

Vol.31 No8

AUGUST 1998

Nicolet's "Odyssey" replaces chart and
DAT recorders taking you "from sensor
to report". Emona Instruments p.10



Web Masters

Internet Reference Guide

Gateways

Programmable Logic Feature

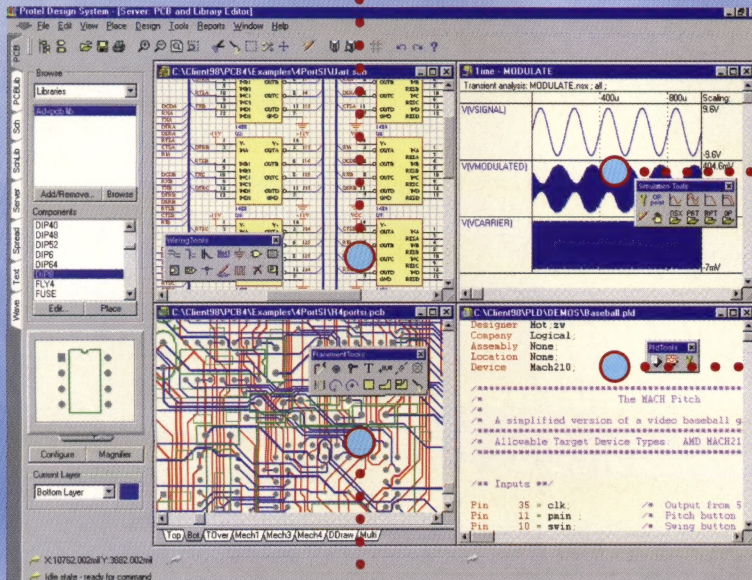
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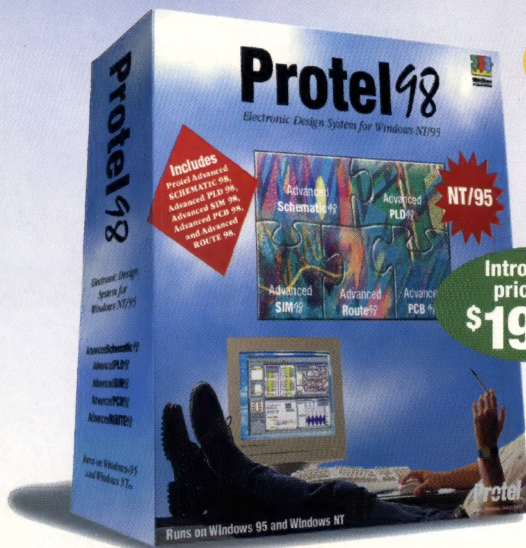
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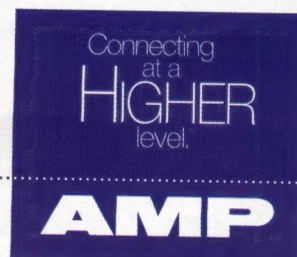
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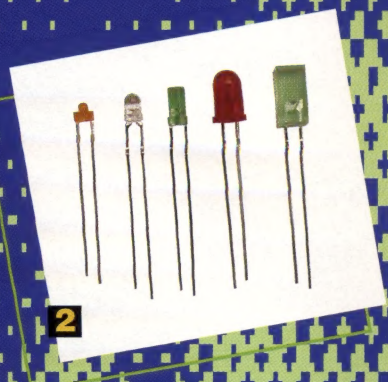


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It's that LED magic again...



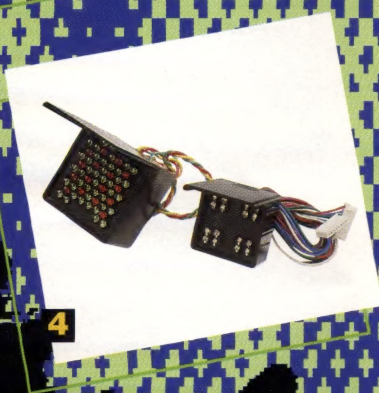
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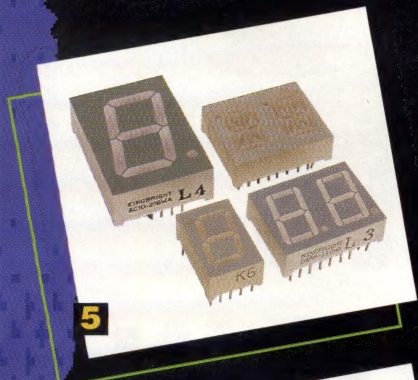
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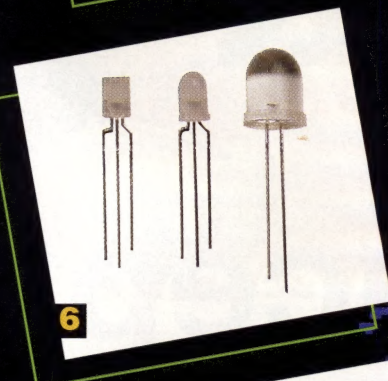
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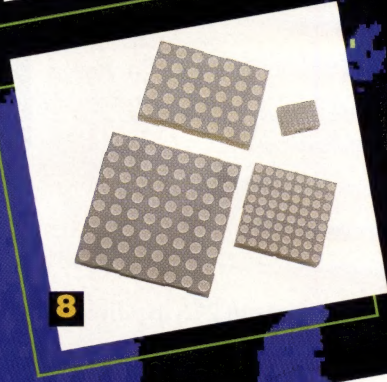
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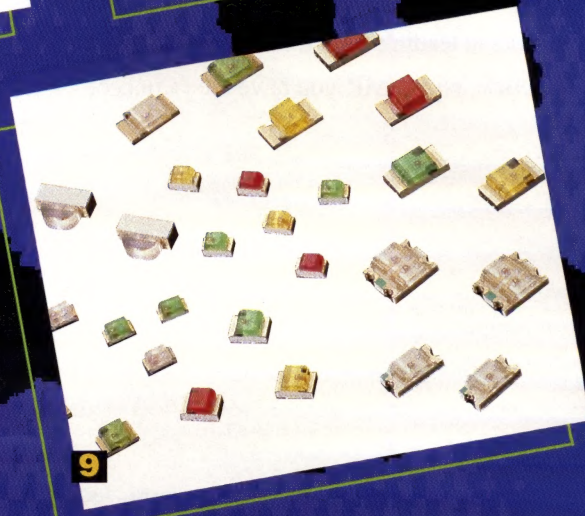
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Component distributor Vettek, part of Arrow Australia, recently celebrated its tenth birthday. See p.14

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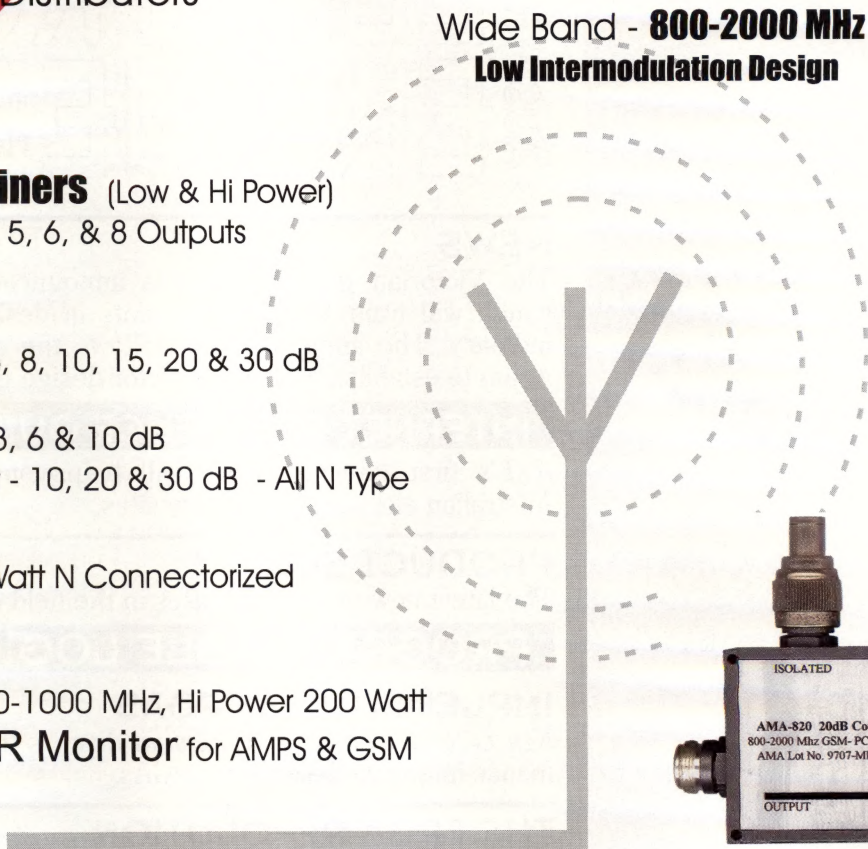
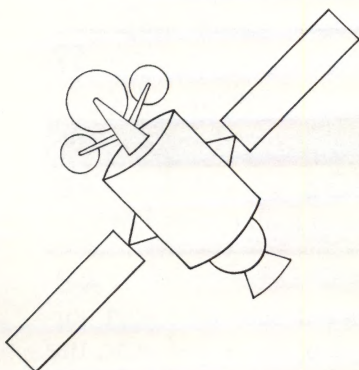
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A PAULINE CONVERSATION

Democracy depends on conflict. The operation of democratic society depends on different groups in society putting up arguments and testing them in public, in the hope that by subjecting them to the blowtorch of mass opinion, the best possible option, based on the combined wisdom of the citizenry, will arise.

It goes without saying that democracy often does not work like that. But it does often enough for democracies to deliver better material and social outcomes than any alternative. The great disadvantage of the democratic way is that it has no defence against the wilfully stupid. The rise of Ms Pauline Hanson is a case in point. Apart from any damage she may do to the civility of Australian society, she threatens our export industries and foreign investment — both near and dear to readers of this magazine — and there appears to be little to be done about it except to endure her.

Still, one can seek to understand. It seems to me that the central problem in Australia for the last twenty years has been that since the demise of Communism, there has only been one economic truth, that espoused by the Department of Finance in Canberra. There has been no serious attempt to create an alternative frame-work on which to build policy. So, with no debate to constrain its wildest excesses, the policies of economic rationalism have swept the land, leaving great efficiency, unemployment and misery in their wake.

It is a system that demands losers. You cannot have a managerial class that measures its success in terms of the number of jobs it has destroyed, without also having a class of people that used to have those jobs. You cannot systematically reduce rural services without creating disaffected rural dwellers. You cannot increase the absolute numbers living in poverty, without diminishing the average feeling of well-being in society.

So ultimately, in a democracy, economic rationalism is a system that contains the seeds of its own downfall. It was only a matter of time before there were so many mad, sad, angry people in Australia that they could form a political party and seek political redress. That is what the democratic process does best, and why we don't have bloody revolutions. It is Australia's enormous misfortune that the first serious challenger to the rhetoric of the Canberra mandarins is Ms Pauline Hanson and her inward-looking One Nation party.

Ms Hanson has been assiduous in identifying the cracks

in our society. But, it has to be said, doing so is hardly rocket science. The clever bit is proposing alternative policies that actually make sense. So far, Ms Hanson has not put up a single proposal that merits serious consideration.

Her industry policy is a case in point. She plans to promote investment by offering bank loans at an artificially low rate of interest. Obviously the policy will need to be funded. Either tax payers must pay for it, or the government must print money. So, she offers us more investment, but at the price of higher taxes or higher inflation. It is hardly an advance.

A second policy is the maintenance of import restrictions to shield the economy from foreign competition. The most obvious result of this will be that foreigners will simply retaliate, endangering our \$40 billion export sector. They have already begun to attack our tourism industry.

Mind you, it has to be said that Ms Hanson's self-evident dislike for the citizens of the nations that are our chief trading partners is likely to do Australia's export industries more damage than her economic policy, such as it is. It's hard to see why an Asian businessman would want much to do with supporters of Ms Hanson.

The biggest danger of Ms Hanson is that people will be deluded into think-

ing that her party represents the only possible response to economic rationalism and globalisation. It doesn't. In fact, Mr Rupert Murdoch, an ex-Australian publisher, hit the nail on the head in a speech in New York recently. Australia, he said, must be less supine in its dealings with the US. Indeed! We might start by not importing its ideology quite so readily.

We might start by recognising that the ideology of globalisation started in the US. It took off there — and was popularised all over the world — by US economic interests for the perfectly obvious reason that it is an ideology that works in favour of big, rich economies like that of the US (and Japan or Europe). It does not work quite so well in small economies like ours.

What we need is a politician with Hanson's appeal to articulate a rational non-rationalist view of the future. It will need to be a view that recognises that, while more trade is not always the answer, Australia's future is as a trading nation. It is impossible to base an effective modern economy on a population of 20 million. We need the world, and the new people, and the new ideas that come with them. ●

"So far, Ms Hanson has not put up a single proposal that merits serious consideration."

Double fault for Intel's server

It is almost becoming a tradition now that if Intel launches a processor, a major bug comes to light just prior to the launch. Just as it was at the launch of the Pentium II a year ago, questions about bugs in the Xeon processor were flying at its launch.

The company is unperturbed, saying it is a very normal thing, a microcode patch has been released, and no hardware changes are required. In fact, a look at the Xeon product specification shows it is indeed a very normal thing. Thirty seven errata are listed in the document.

The Xeon will take over from the Pentium Pro and is specifically designed for mid-range and higher workstations and servers. It incorporates features that will cope better with Internet services, corporate data warehousing, digital content creation, and electronic and mechanical design automation. It has done this with larger and faster L2 caches, multiprocessing capabilities and a 100MHz system bus. Systems based on the Xeon can be configured to scale to four or eight processors and beyond.

It is built using 0.25 micron P6 microarchitecture and offers Intel's extended server memory architecture. This provides full 36-bit addressing support from the processor, level one and two cache,



Intel's Pentium II Xeon processor is the first in a new family designed to meet the demands of mid-range and higher servers and workstations.

and chip set. Together, they provide a non-intrusive evolutionary path for enterprise applications that need to exploit more than 4GB of memory. Like the Pentium II it will come in the SECC (Slot 2) package

and will feature MMX technology.

A number of OEMs, including Acer, Compaq, Dell, HP, IBM and UMAX announced their support for the new processor at the launch.

Victorian students get semiconductor training

The Victorian government has announced its Chipskills Program, which will train Victorian students in design for the semiconductor industry. The announcement follows the decision by Korean based Anam to establish a semiconductor design centre in Melbourne called, Semiconductor Technologies Australia.

The program will involve Semiconductor Technologies Australia, the Victorian Government, seven universities and the Technical and Further Education sector.

"The design and manufacturing activities associated with semiconductors require very high levels of specialised

skills. While many countries can offer financial incentives, land and like inducements, a key determinant for semiconductor industry development is the timely availability of the specialised skills required," said Victorian Minister for Information Technology and Multimedia Alan Stockdale.

"To put these needs in perspective, just one large chip production facility can employ around 3,000 people of which around 750 are specially qualified engineers, 750 are skilled technicians and the remaining 1,500 are skilled operators. Upskilling of this magnitude requires a major and innovative approach. It par-

ticularly requires constructive co-operation between our universities and TAFE's."

The focus of the program is on developing post graduate courses in semiconductor technology as this is seen as the quickest way of increasing the skills of the large numbers of engineers which would be required by the any major semiconductor facility investment.

Semiconductor Technologies Australia is providing 50 sets of design tools to the Chipskills member universities and TAFE's and is implementing a program of design tool training with these institutions, both at the institutions and at its Victorian Semiconductor Design Centre.



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Thumbs up for Alcatel move

The Australian Telecommunications Industry Association (ATIA) has applauded Alcatel's decision to outsource its Australian telecommunications manufacturing activities to Bluegum Technologies, saying it is "a reaffirmation that Australia can match it with the rest of the world in electronics manufacturing".

The Association said the contract assembly industry is now the fastest growing sector of the electronics hard-

ware industry and is estimated to be worth \$450 million with growth exceeding 50% per annum.

"Alcatel's decision to keep manufacturing onshore, coupled with recent announcements such as JNA's outsourcing contract with Australian Electronic Manufacturing Services for the Opal product demonstrates the competitive strengths of the Australian electronics industry in supplying advanced and complex telecommunications products," it said.

Tektronix recalls scopes

Tektronix has announced it is recalling all its TDS210 and TDS220 oscilloscopes because of a fault that could lead to electrocution if incorrectly used.

If a user incorrectly connects a probe ground lead to a voltage source or incorrectly touches the ground ring near the probe tip to a voltage source, a circuit board trace in the oscilloscope's ground path may open. Once this occurs, the product may appear to function normally but the unit is no longer properly grounded and use could result in a potentially fatal electric shock.

The recall applies to approximately 60,000 units. For the TDS210, it covers

serial numbers below BO49400 or CO10880. For the TDS220, it is serial numbers below BO41060 or CO11175.

Jimmy Hong of Tektronix said that, as far as he knew, no one had been injured due to the defect and, provided it is used correctly, the product is safe.

However, customers should stop using the recalled oscilloscopes immediately and contact Tektronix to receive instructions on how to return the product for modification.

You can contact Tektronix Australia on 1800 023 342 extension 193 or by visiting the company's web site on www.tek.com/measurement.

Fluke accreditation

Philips Test & Measurement has announced that its supplier Fluke is the first US electronics company to receive Deutscher Kalibrierdienst (DKD) accreditation for both its standards laboratory and calibrator production facilities. The company says the uniqueness of the accreditation comes from unprecedented cooperation between the US National Voluntary Laboratory Accreditation Program and the DKD.



Fluke's German standards accreditation may help break down some of the barriers between international standards accreditation.

Axion gets Seho

Axion Australasia has announced it is now the sole distributor of German soldering systems manufacturer Seho. The company produces wave soldering equipment with flexible systems, selective soldering with laser or mini-wave technology, and reflow soldering with full convection or condensation. Axion was previously just responsible for Seho service.

M+H on the move

M+H Power Systems has relocated its main distribution warehouse in Melbourne to 9 Mosrael Pl, Rowville. The new premises have 700m² of high rack warehousing with room to expand a further 700m² in the near future. The new phone number is (03) 9763 0555 and fax is (03) 9763 0577.

Eltek signs PK deal

Eltek Pacific has been chosen by PK Electronics to be its Australian distributor. PK focuses on designing power solutions, including what it says is the world's first modular parallel redundant uninterruptible power system for high performance networks. Eltek will provide service and technical support for the products from its Sydney and Brisbane offices.

"From sensor to report"

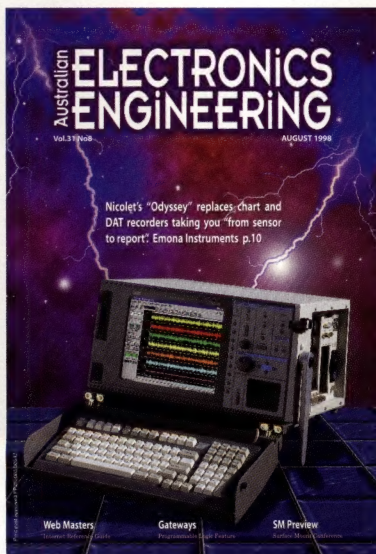
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The Windows control and display software gives you all the advantages of a graphical operating system: point-and-click convenience, familiar menus, on-line help, and a wide selection of printers, archive media and networks. The Odyssey front panel also lets you control the unit without ever touching the mouse if you prefer.

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Fibre centre for Melbourne



Robert Jarvis

Cable manufacturer AMP has announced it will increase emphasis on fibre management systems (FMS) products and is creating an FMS Com-

petency Centre in Melbourne that will provide complete fibre interconnect systems solutions.

Australian AMP general manager Robert Jarvis said: "AMP's decision to invest in engineering and new product development here in Australia is an excellent fit. Australia has long been recognised as a leader in telecommunications and the deployment of fibre optics. The availability of a highly-trained well-educated workforce is a real plus, in addition to access to world-class R&D resources such as the Australian Photonics Cooperative Research Centre.

The decision is based on the company's acquisition of Fibernet in 1997. The company has recruited Brian Wright from Olex Cables to head both Fibernet and the FMS Competency Centre. Fibernet founder Dr Allen Conduit is now director of engineering for the FMS Competency Centre.

Victoria introduces E-Commerce legislation

Victorian Minister for Information Technology and Multimedia Alan Stockdale has released an exposure draft of an Electronic Commerce Framework Bill. In general the Bill operates on the principle of functional equivalence between electronic and manual signatures. It does not provide for the regulation of certification authorities but establishes an Electronic Signature Recognition Body.

The term 'Electronic Signature' is given a broad definition. It envisages a process of authentication applied by a person to a document in electronic form. The process must also have been applied for the purpose of signing the document. As the definition adopted is technology neutral, the framework is not limited to

authentication processes already in existence. It also does not favour one process over another.

The task of establishing authentication standards is left to the development of industry Codes of Practice. But the Codes will need to be approved by the Minister. It is envisaged that compliance with an approved code will provide adequate proof in court of the authenticity of the electronic signature.

Part of the Bill proposes to amend the Victorian Crimes Act to include new offences that deal with abuses of information stored on computers. Some of the offences created include:

- the deliberate unauthorised accessing of data;
- the gaining of access to data where the offender has the intent to defraud;
- the gaining of access to data where the offender knew or ought to have known that the data was of a sensitive nature.

Stockdale also announced proposed data protection legislation aimed particularly at consumer transactions on the Internet. It will be the first time any Australian Government has introduced such legislation. "Victoria has long stated the need for a national approach on this important issue and if the Commonwealth decides to proceed with suitable national legislation, Victoria will certainly offer its full support," he said.

"These two draft Bills will provide the necessary legal framework and infrastructure for Victoria to be competitive and proactive in a global economy."

Automation web site

National Instruments has announced its Automation Web site www.natinst.com/automation, designed specifically for industrial automation users. It contains information on how to connect systems to Fieldbus networks, interface PCs to CAN devices, integrate image acquisition into new or existing applications, and monitor and control industrial automation systems via the Internet as well as product information.



The AutomationWeb site

Pirelli wins Telstra contract

Pirelli Cables has been awarded a contract to supply Telstra's cable requirements until 30 June 2001. The value of the contract is believed to be in the \$200 to \$300 million range and covers optical and copper cables. "This contract represents a very important achievement for us," said Pirelli Cables CEO Italo Mazza. "The move from approximately 27% of Telstra's requirements to this new level will strengthen the company's position, giving the base for economies of scale."

Engineering jobs

Engineering and technical resource companies Adecco Value Engineering and Jon & Associates have merged to form TAD Technical Careers and Contracts, which it claims is the world's largest engineering personnel resource company. The TAD name comes from a US company purchased by Adecco in 1997. TAD CEO Gary Cox said: "Whilst branded TAD, the Australian operation will maintain total autonomy. The only real link internationally will be the value asset of a global resource capability."

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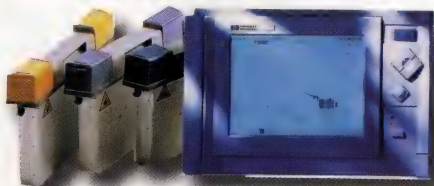
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Component distributor Veltek, part of Arrow Australia, recently celebrated its tenth birthday. Seen at the celebrations were Arrow Australia regional director Greg Hansford (second from left), Zatek managing director Stewart Booth (centre) and executive vice president of Arrow Electronics Robert Klatel (far right).

The Elegant Solution

SBS is going to present a 13 part television series on great engineering feats of our time. Shot in 16 different countries, the first episode will go to air at 6pm on 11 August.

Siemens selling semiconductors

In the wake of Siemens' announcement that it was facing a loss of over 1 billion marks (more than A\$850 million) in its semiconductor business, the company is closing down that business. It will either shut down or sell its five factories, according to a report in Associated Press.

IBM and ST join forces

IBM and ST Microelectronics have announced a joint effort to try and accelerate the development of advanced system on-chip products. The agreement includes the exchange of intellectual property including microprocessor and microcontroller cores, digital signal processors, memory blocks, communication cores, and sound and video cores. "Our joint efforts will accelerate the proliferation of single chip solutions and help spread the power of the information network to new user," said IBM Microelectronics general manager Dr Michael Attardo.

Keeping tabs on the Net

Hewlett-Packard has released what it claims is the industry's first service management solution for Internet service providers. Its Firehunter software allows ISPs to monitor, measure and analyse key elements of the infrastructure on a single screen. H-P's Chuck Darst said ISPs were growing at a phenomenal rate and were finding it hard to get operators who understood the systems and how to quickly analyse problems with the system. "With this software, we are trying to track the user's experience," he said.

Who cares?

Caring, sharing electronics industry types might be interested to know that in Austria a group has been formed called CARE (a Comprehensive Approach to Electronics Recycling), which is working on an environmental blueprint for the electronics industry. It has attracted the involvement of a number of companies including IBM, ICL, Matsushita, Motorola, Nokia, Nortel, Philips, Siemens and Sony as well as governments, recycling companies, industry associations and research institutes. In 2003 the electronics industry will be subject to an EU directive on waste arising from end-of-life electronics.

Billions to be lost in 2000

The chairman of the federal government's Year 2000 steering committee Maurice Newman says a serious recession could result from a failure to deal with the Millennium Bug. He says if just 10% of small to medium-sized enterprises (SMEs) fail to deal with the bug, the country could lose \$12.5 billion and more than 350,000 jobs.

"It's not simple," he said. "There are no shortcuts and no silver bullet will save the day. All SMEs need to understand the scale and the potential for disruption. No organisation can assume that they will not be affected, either directly or indirectly. They must review their individual situation."

According to Australian Bankers Association CEO Tony Aveling, there is an

alarming sense of complacency with 80% of small businesses possibly affected but with only 22% of small and 15% of medium businesses preparing for the date change. "Microchip control systems are at the heart of many businesses," he said. "Lack of action could mean lack of business."

Ken Pritchard, program director of the Commonwealth Bank's millennium project, said he is replacing customers that are unable to provide proof of their preparedness for the date change. "Our systems are so interdependent that, even if your company is 2000-ready, the effects of non-compliant suppliers and customers could see many businesses suffer."

The government has set up a hot line 1800 11 2000 for more information. ●

Electronics forum takes shape

The Australian Electrical and Electronic Manufacturers' Association has announced a national forum on the industry to take place on September 17-18 in Sydney. "The turnover of elec-

trical and electronic industries in Australia is vital to the nation's economic prosperity, a point not always well recognised, particularly at the political level," said AEEMA executive director Alex Gosman.

The forum will look at globalisation, deregulation, trade and emerging markets; emerging opportunities for the electronic and electrical industry; and threats to the operations of the telecommunications and energy sectors. Speakers will include federal treasurer Peter Costello and shadow minister for industry and regional development Simon Crean.

A feature of the forum will be the Soanar Great Debate where radio jock Alan Jones will join Gosman, Alcatel's Ron Spithill, NOIE's Paul Twomey, Cutler & Company's Terry Cutler and DIST's Alan Evans in discussing the question, "Who drives the direction and acts upon changes in the Australian electronics and electrical industry — the customer, the supplier, the manufacturer or the government?" ●

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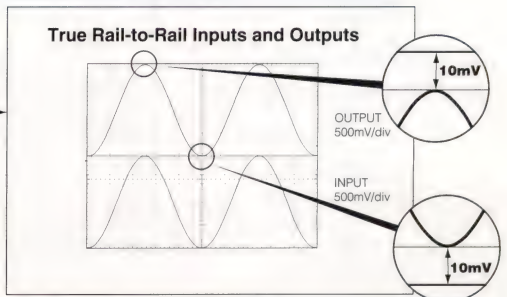
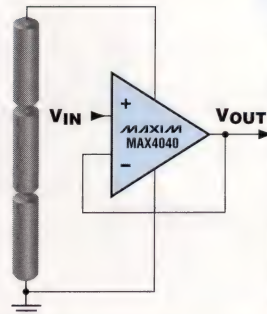
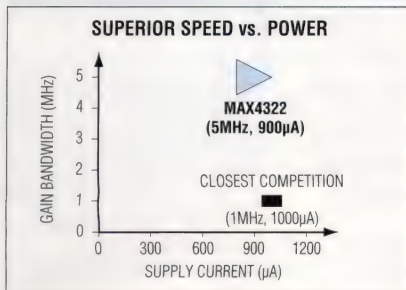
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MAX4326/27	2	5MHz	+2.4 to +5.5	900	400	0.86/0.94	8-pin SO/µMAX, 14-pin SO, 10-pin µMAX
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INTERNET REFERENCE GUIDE

Given the tremendous growth in the Internet, the following handy guide should help you navigate around various Australian electronics industry sites.

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Acetronics
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Amalgamated Instrument
www.aicpl.com.au/aicpl

AMD
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Australian Exhibition Services
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Australian Padprinting Supplies
www.world.net/Business/aps/

Automation & Process Control
www.workmate.com

Avnet Pacific
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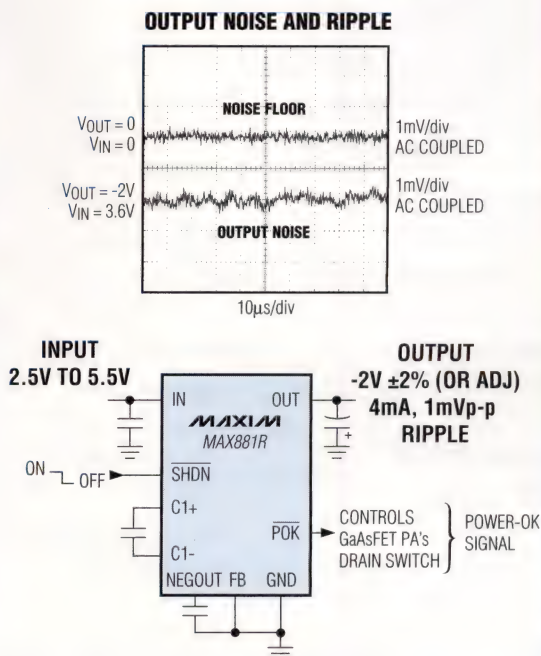
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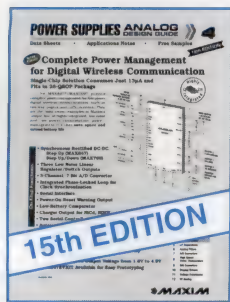
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In-Circuit Design

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Intelligent Systems

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Interworld

www.ieci.com.au

IR Electronics

ourworld.compuserve.com/homepages/irelectronics~

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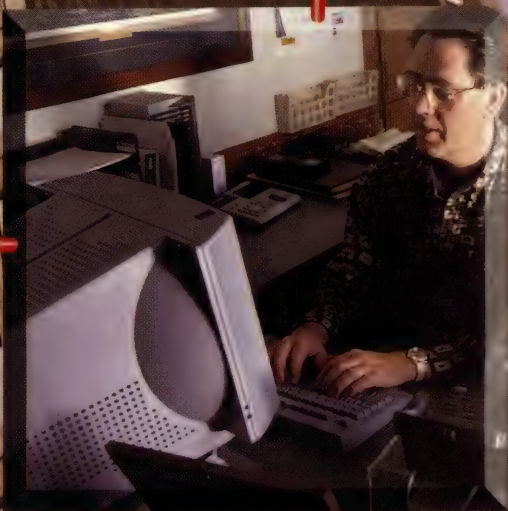
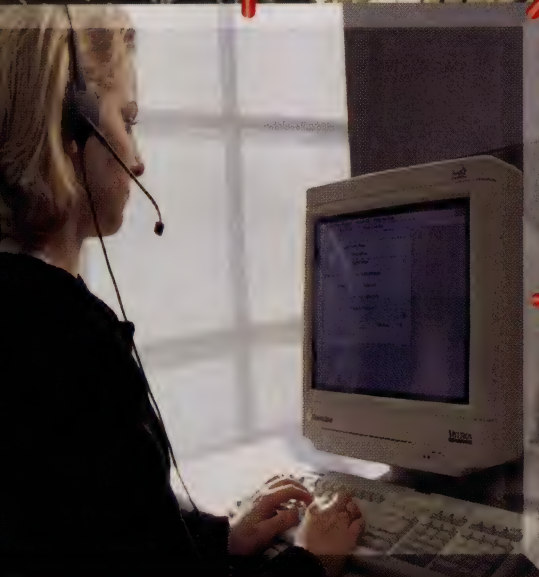
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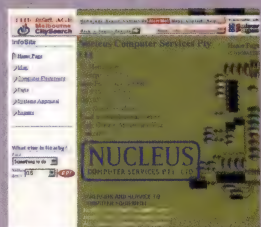


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Currently, our home page covers areas such as Soanar the Company, Branch Locations, our Product Linecard and What's New as well as "hot links" to all of our major franchises. Emailing marketing or sales personnel within Soanar is also made easier by building them into our home page.

Having acknowledged the importance of the Internet as a business tool, Soanar will be constantly looking at ways of increasing the value offered by our homepage and continuously improving this business tool designed to make your life easier.

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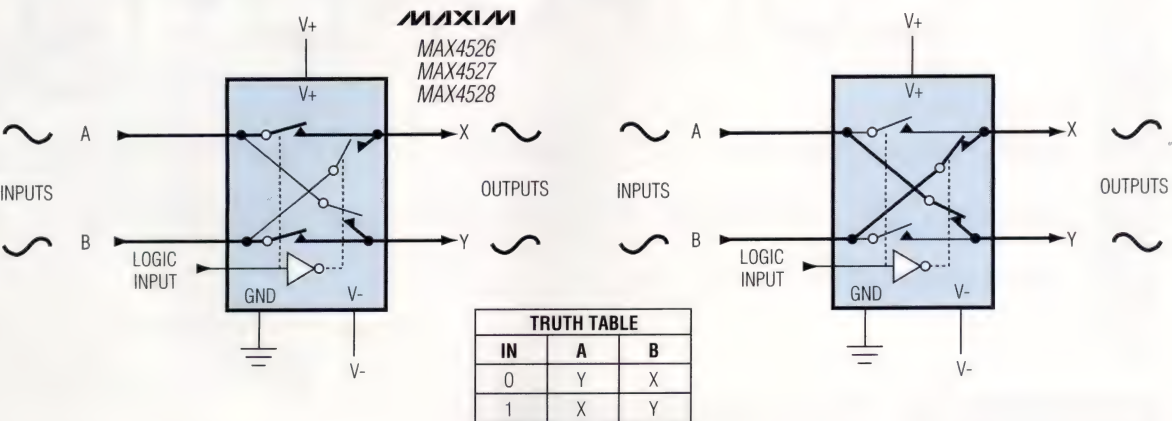
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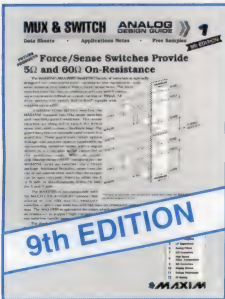
INDUSTRY'S FIRST PHASE-REVERSAL SWITCHES AVAILABLE IN 8-PIN μ MAX PACKAGE

Four Matched SPST Switches Simplify Polarity/Wiring Phase-Reversal



The MAX4526/MAX4527/MAX4528 are phase-reversal analog switches consisting of two normally open and two normally closed CMOS switches arranged in a bridge configuration. These parts are designed to have matched t_{ON}/t_{OFF} times and charge injection (2pC max). They're ideal for use in lock-in amplifiers and synchronous demodulators. The bridge configuration also makes them easy to use in Auto Cal and VOS cancellation circuits and in polarity/wiring phase-reversal type applications. The MAX4526/MAX4527 are designed for $\pm 15V$ applications, while the MAX4528 is optimized for low voltages ($\pm 2V$ to $\pm 6V$) and low power consumption. Each switch is designed for 175 Ω max on-resistance and matched to 8 Ω . All parts are available in commercial and extended temperature ranges in 8-pin μ MAX, SOIC, and DIP packages. Logic inputs are TTL/CMOS compatible.

PART	TRANSITION TIME (ns max)	CHARGE INJECTION (pC max)	CHARGE-INJECTION MATCH (pC max)	LEAKAGE CURRENT (nA max)	SUPPLY CURRENT (μ A max)	OPERATING SUPPLIES (V)
MAX4526	100	10	2	0.5	1000	± 4.5 to ± 20
MAX4527	200	10	2	0.5	400	± 4.5 to ± 20
MAX4528	200	5	2	0.5	1	± 2.7 to ± 6



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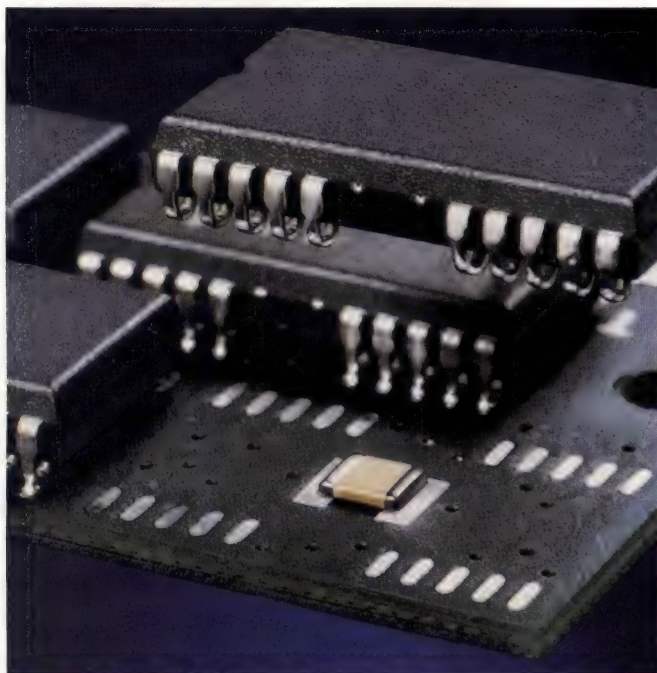
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ELECTRONIC COMPONENTS

This month's product surveys features the latest electronic components. For more information on any item, see www.aee.com.au



SM chip capacitors

Captron has released the Johanson MemoryGuard series of low profile Z5U ceramic chip capacitors designed for memory de-coupling applications.

They are offered in three standard EIA case sizes (0805, 1206 and 1210) and four different device heights so they can be mounted directly beneath most memory packages. Capacitance selection includes standard decoupling values of 0.12 μ F through to 0.47 μ F with other values available on request. Standard packaging is in 8mm paper tape on 7in or 13in reels.

Enquiry number: 1241

Single chip EEPOT

The Xicor X9400 family of electrically erasable potentiometers (EEPOTs) is available from R&D Electronics. They can be used in set-top volume control, cellular phone audio adjustments, LCD contrast controls, radio frequency tuning, laser diode bar code readers, engine controls, DVD players, etc.

The three family members include the X9400 with four EEPOTs, the X9410 with two EEPOTs and the X9420 with one EEPOT. Each EEPOT offers 64 different resistance settings which are written or read via a serial peripheral interface at 2Mb/s. Since the settings are stored in non-volatile, electrically erasable memory, they remain even when the device isn't powered.

The devices use embedded EEPROM to store up to four wiper positions for each potentiometer. The sixteen 6-bit registers that hold the wiper positions can also be used for general purpose non-volatile storage.

Enquiry number: 1246

IGBT family

GEC Electronics has released the Mitel ITS range of discrete insulated gate bipolar transistors (IGBTs). They have been designed to bring low power dissipation and ease of operation to demanding inductive switching applications.

Products in the range feature a short circuit withstand time of 10 μ s and a wide reverse bias safe operating area. Typical saturation voltage for the ITS40F06

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is 2V at 35A with total switching losses of 2.8mJ at 35A. Devices can be selected to drive motors rated from 0.5hp to 10hp.

Available in industry-standard packages (TO-220, TO-247 and TO-264), the range comprises 600V and 1200V options rated from 8A to 60A. the products are available as single IGBTs or co-packaged with an integral anti-parallel diode.

Enquiry number: 1243

Ferrite beads

Vishay Dale is offering a line of multilayer ferrite beads, designed for EMI/EMC filtering needs. The beads come in 0603 and 0805 surface mount sizes, complementing the standard 1206 size.

The multilayer ferrite product line also includes a high current low profile inductor (ILS-3825) designed for portable devices including notebook computers, PCMCIA cards and handheld products.

A feature of the products is a broad impedance range. The ILBB-0603 covers 30 Ω to 1000 Ω and the ILBB-0805 covers 11 Ω to 2000 Ω . Rated dc current for the 0603 is 50-400mA and 80-600mA for the 0805.

Enquiry number: 1244

RF chokes



Westek Industrial Products has released the Schaffner RN-series of current compensated RF chokes suitable for PCB mounting. Typical applications include uninterruptible and switch-mode power supplies, dc-dc converters, etc.

The chokes are designed to provide high attenuation of common mode interference in the range of 100kHz to 3MHz while differential mode signals in the operating range encounter zero inductance. They employ toroidal ferrite cores to improve the inductance to volume ratio and dual current compensated windings to prevent core saturation when handling large peak currents.

The RN chokes are available for load current ratings from 0.3A to 10A with a voltage rating of 250V and path inductances ranging from 0.7mH to 100mH. They are available in low-profile or small footprint housings and withstand winding-to-winding and winding-to-housing voltages of 1500Vac and 4000Vac, respectively, for one minute.

Enquiry number: 1242

Digital audio converter



Zatek has released the Texas Instruments TMS320AD90 digital audio converter. It is a 16-bit stereo audio codec that is fully compliant with Intel's AC'97 specification. The device also provides an integrated 600 Ω power amplifier.

The device offers 94dB typical SNR on the DAC and 93dB SNR on the ADC. High quality FIR and Bessel linear phase filtering is also used. Typical current is less than 55mA total when the outputs are driving 10kW loads. In power down standby mode, it is 100mA.

Applications include video and audio conferencing, musical instruments and PC audio cards.

Enquiry number: 1247

High precision op amp

Available through NSD, Burr-Brown's OPA277 series of high precision op amps replaces the OP-177. The new models offer lower offset voltage (20 μ V vs 25 μ V max) and lower offset voltage drift (0.15 μ V/ $^{\circ}$ C vs 0.3 μ V/ $^{\circ}$ C max) compared to the OP-177.

The series is suited to precision measurement of low-level signals such as those from thermocouples, strain gauges and bridges. An Iq of 800 μ A means they're also suitable for battery-powered instruments. They operate from \pm 2V to \pm 18V supplies.

The series is available in single (OPA277), dual (OPA2277) and quad (OPA4277) versions. The single and dual versions are available in 8-pin DIP and SO-8 surface mount packages. The quads come in 14-pin DIP and SO-14 surface-mount packages. Other features include an open-loop gain of 134dB, common mode rejection of 140dB, power supply rejection of 130dB and bias current of 1nAmax.

Enquiry number: 1245

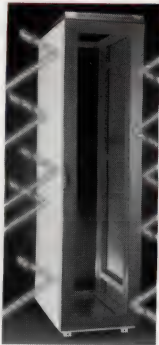
SOT-23 voltage reference

Available through ACD, the Linear Technology LT1460HCS3-2.5 and LT1460HCS3-5 precision series 2.5V and 5V bandgap references are now available in an SOT-23 package.

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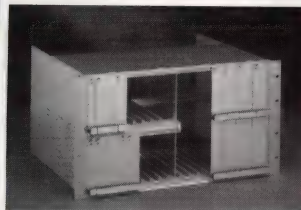
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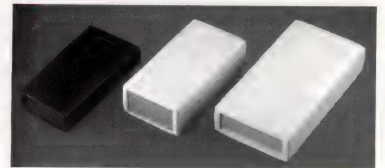
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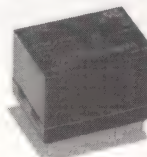
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Enquiry number: 1249

Link layer chips



Zatek has announced four IEEE 1394 (FireWire) link layer interface devices from Texas Instruments.

The devices are the TSB12LV01 high speed serial bus link layer controller; TBS12LV21B (PCI-Lynx 2) IEEE 1394 to PCI bus interface; TSB12LV31 GP2Link; and TSB12LV42 DVLink.

Optimised for 400Mb/s performance, the devices provide high speed data transmission for throughput intensive applications such as digital video and audio, and hard disk drives.

Enquiry number: 1248

Low noise op amps

Veltek has released a range of Maxim low noise op amps. The MAX4104 is unity-gain stable and draws 20mA while delivering 880MHz bandwidth and 400V/µs slew rates. The MAX4304, compensated for a minimum gain of 2V/V delivers 730MHz and 1000V/µs.

The MAX4105 is compensated for 5V/V or greater gains and delivers 430MHz and 1400V/µs. While the MAX4305, compensated for 10V/V or greater, delivers 350MHz and 1400V/µs.

Input noise voltage density is 2.12.1nV/√Hz and spurious-free dynamic range of -84dBc making the devices suitable for low-noise low-distortion applications in video and telecommunications. They feature an output-voltage swing of ±3.7V and ±7mA output-current capability. The devices are available in 5-pin SOT23 and 8-pin SO packages.

Enquiry number: 1250

Small DSPs

Insight has introduced the Analog Devices ADSP-218x family of digital signal processors. It includes the ADSP-2189L, ADSP-2187L and the ADSP-2183, which the company says is approximately 50% smaller than any other DSP available.

The ADSP-2183's 144-ball chip array packaging is 1.25mm high and covers 1cm². It also features 0.8mA/MIPS performance. The 3.3V ADSP-2187L and the 2.5V ADSP-2189L both offer up to 1.5Mb of on-chip SRAM. They are suitable for portable handheld applications such as two-way paging, Internet appliances and cellular equipment.

Enquiry number: 1251

16-bit/20-bit A/D converters

Cirrus Logic's CS5501 and CS5503 CMOS A/D converters are suitable for measuring low-frequency signals representing physical, chemical, and biological processes, and are now available from Braemac. The devices use charge-balance techniques to achieve 16-bit (CS5501) and 20-bit (CS5503) performance with up to 4kHz word rates.

The converters continuously sample at a rate set by the user in the form of either a CMOS clock or a crystal. On-chip digital filtering processes the data and updates the output register. The converters' low-pass, 6-pole Gaussian response filter is designed to allow corner frequency settings from 0.1Hz to 10Hz in the CS5501 and 0.5Hz to 10Hz in the CS5503. So, each converter rejects 50Hz and 60Hz line frequencies, as well as any noise at spurious frequencies.

Each device's serial port offers two general-purpose modes of operation for direct interface to shift registers or synchronous serial ports of industry-standard microcontrollers. In addition, the CS5501's serial port offers a third, UART-compatible mode of asynchronous communication.

Enquiry number: 1252

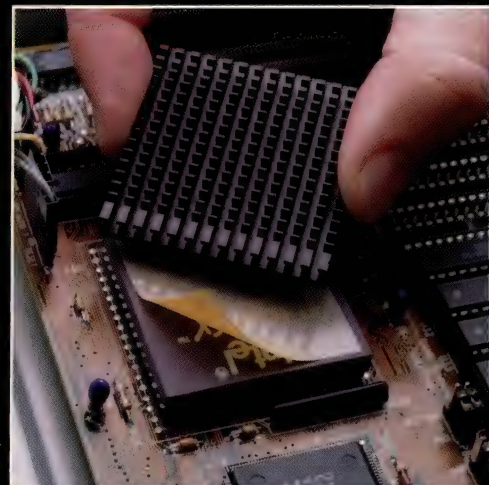
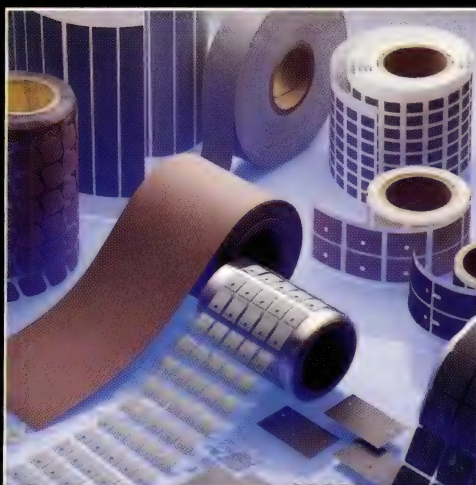
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New Product Catalogue

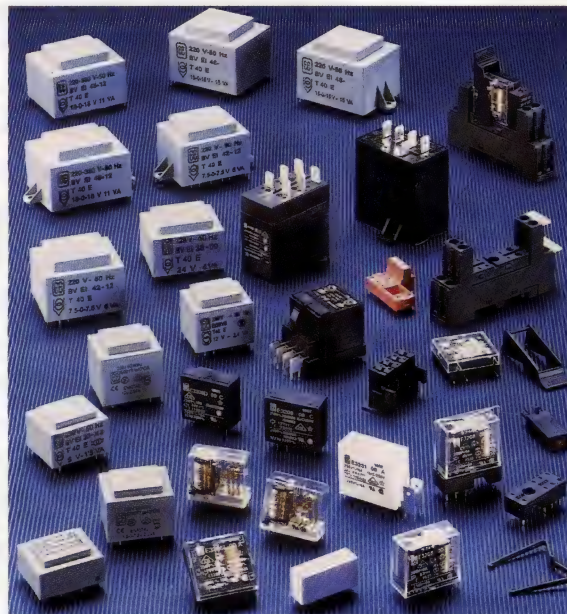
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Miniature relays



C&K Components Plus is offering a range of Celsa Eichhoff miniature and industrial relays for direct and alternating current. They are certified to European and American standards.

Hall effect switch

The Cherry HE-6450 Hall effect vane switch is available from Adilam Electronics. It is designed for applications such as office equipment, business machines, fitness equipment, industrial controls, appliances and factory automation equipment. Housed in a plastic package, it is also suited to hostile electrical, chemical and mechanical environments.

It incorporates a temperature compensated Hall effect integrated circuit with a rare earth permanent magnet. A customer-provided ferrous metal interrupt or vane completes the sensing system. It is furnished ready for applications that use optoelectronic interrupts. The three-pin plastic housing with standard mounting holes has leads spaced at 1.27mm (0.05in) and a digital output. The housing also features a channel which defines the path the vane must travel.

The switch measures 24 x 6 x 11mm and is designed to operate in temperatures from -20°C to 85°C. Supply voltage can range from 4.5 to 25Vdc.

Enquiry number: 1253

Op-amps for multimedia

Available in Australia through Braemac is SGS-Thomson Microelectronics' family of low-cost op-amps for multimedia applications. The TSH93

triple op-amp and the TSH94 and TSH95 quad op-amps are designed with an advanced BiCMOS process.

Key parameters include 150MHz bandwidth, 0.07° differential phase, 0.03% differential gain and 0.1dB maximum gain flatness at 6MHz. A slew rate of 110V/μs, a low noise figure, and a total harmonic distortion (at 1kHz) of only 0.01% coupled with outputs specified for 600 and 150 loads, make these devices suitable for a range of applications including satellite receivers (set-top-box), pay TV, audio equipment and industrial instrumentation.

Offered in both DIP16 and surface mount SO16 plastic packages (DIP14/SO14 for the TSH93), the devices operate over the -40 to 125°C temperature range with a 7-12 V supply range. A SPICE macro-model is included in the specification.

Enquiry number: 1254

Chip inductors

IRH Components has released the Toko PTL series of chip inductors. The inductors are targeted at VCO, GaAs amplifier matching and notch filter applications.

The inductors are made using photolithographic etching. The company says the advantages of this method are: better temperature stability (150ppm/°C compared to 250ppm/°C); higher average Q values; and tighter tolerances.

Enquiry number: 1294

Resistor-capacitor networks

Captron has introduced the Electro-Films RCN series of R/C networks. They are suitable for high frequency filtering applications such as the elimination of unwanted EMI/RFI radiation in high speed digital applications.

Although most applications require low value resistors, values up to 1MΩ are available along with capacitances up to 1000pF. The chip size necessary is proportional to the capacitance values. Resistance tolerances down to 0.1% and capacitance tolerances down to 5% are available.

Enquiry number: 1295

5-pin PWM

The Toko TK75001 is a 5-pin primary side controller integrated circuit available from IRH Components. The device can be used as a PWM for off-line power supplies. It incorporates adjustable slope compensation and a 1A drive with only five active pins.

The pin count reduction is possible through a multifunction feedback pin which combines a PWM/current control function, a built-in compensation ramp, and a pulse-by-pulse current limiter with frequency reduction (to prevent short circuit runaway).

Enquiry number: 1296

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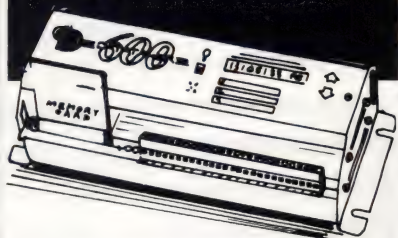
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PROGRAMMABLE LOGIC

IMPLEMENTING FPGAS

Ken O'Neill and Dave Wurthman discuss the implementation of performance-intensive designs in FPGAs.

Unleashing the performance capabilities of FPGAs is a tricky and often frustrating process. Even if one can find a part that is quick enough and one is willing to jump through all the hoops required to achieve that performance, getting data on and off chip fast enough is virtually impossible, so one is forced to break a critical portion of your logic out and drop it into a CPLD.

However, a new family of FPGAs developed by Actel are designed to be so fast one no longer need to implement workarounds to achieve performance.

times compared with equivalent CPLDs or FPGAs, for easy thermal and power supply design;

- reduces component counts and board space requirements.

Designs that were previously relegated to ASICs can now be implemented in SX FPGAs without compromising performance, or enduring lengthy prototyping and production times.

Fast and Flexible New Architecture

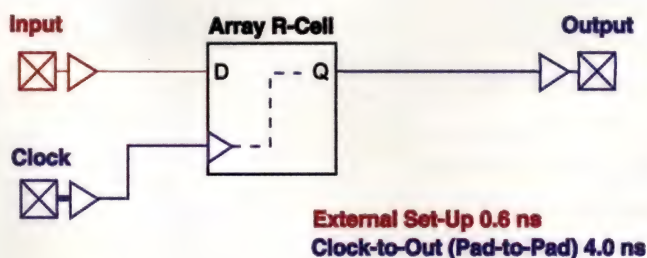


Figure 1: High-performance internal logic delivers fast clock-to-out and fast input set-up times without HDL instantiation.

This intrinsic high performance is achieved by a combination of low-impedance routing interconnect elements, segmented and local routing tracks, and finely-structured logic cells, optimised for fast and efficient mapping of synthesised logic functions. The unique routing structure gives fast,

The Benefits of Speed and Capacity

The SX family offers internal clock speeds exceeding 320MHz, clock-to-out at 4.0ns, and pin-to-pin 25-bit decodes at 6.6ns. For designs which previously would be segmented between CPLDs (for speed) and FPGAs (for capacity), the combination of high density and high performance reduces the number of components required to implement a design. This:

- improves system reliability and eases system logic integration;
- lowers power consumption about two

predictable performance and allows 100% pin-locking with full logic utilisation, reducing design time and allowing designers to achieve performance goals with a minimum of effort. The flexible routing structure is complemented by a hardwired, constantly-loaded clock network tuned to provide fast clock propagation with minimal clock skew.

Additionally, the high performance of the internal logic has eliminated the need to embed latches or flip-flops in the I/O cells to achieve fast clock-to-out or fast input set-up times. The I/O cells do not require HDL instantiation, facilitating design re-use and reducing design and debugging time. Figure 1 illustrates

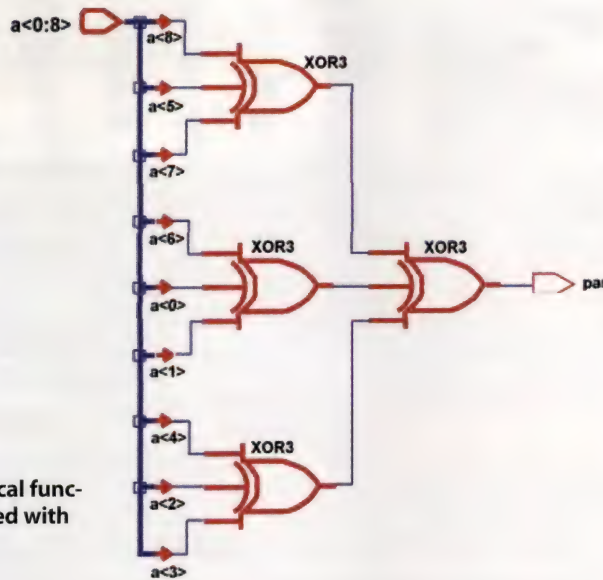
Verilog Example for a Parity Tree

```
Module parity( a, par );
input [0:8]a;
output par;
reg par;

always @( a )
    par = ^a;

endmodule
```

Figure 2: Performance-critical functions are easily implemented with SX devices.



VHDL Example of a Parity Tree

```
library IEEE;
use IEEE.std_logic_1164.all;
use IEEE.std_logic_arith.all;

entity parity is
    port(a : in std_logic_vector(8 downto 0);
         par : out std_logic);
end entity;

architecture behave of parity is
begin
    process ( a )
        variable aux : std_logic;
    begin
        aux := '0';

        for i in 0 to 8 loop
            aux := aux xor a(i);
        end loop;

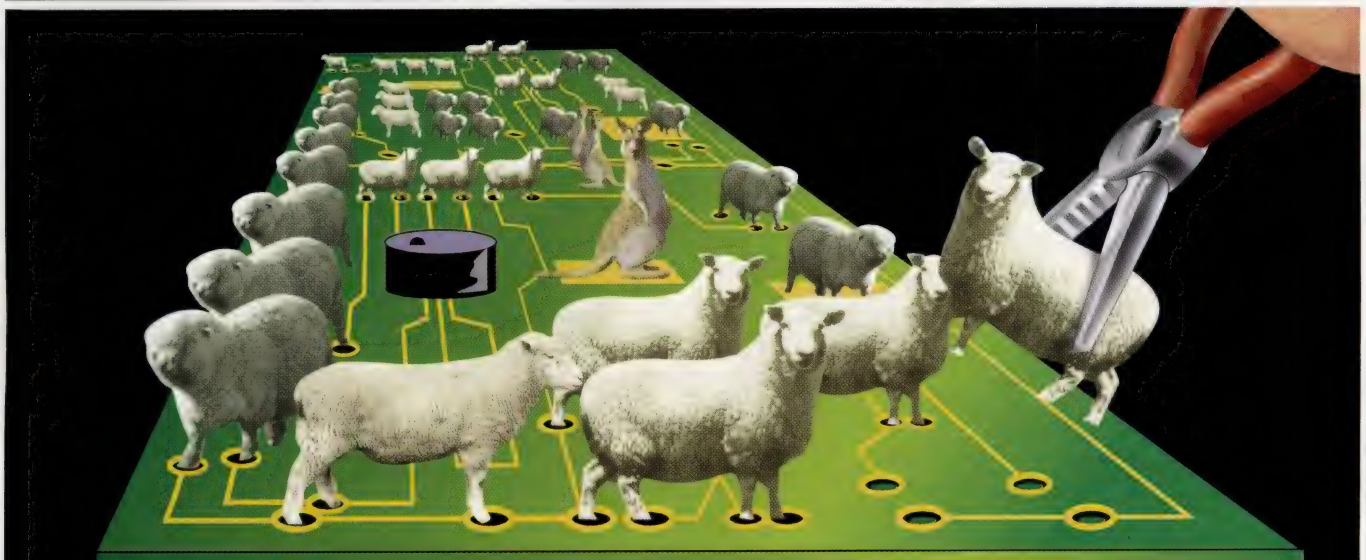
        par <= aux;
    end process;
end behave;
```

the fast clock-to-output and input set-up time.

SX devices enable a high level of performance without requiring complicated design techniques such as the use of

redundant logic to reduce fanout on critical nets, the introduction of data pipelining to reduce register-to-register delays, or the instantiation of structural macros in VHDL or Verilog-HDL code.

Simplifying a design also reduces the debugging process, which is further facilitated by ActionProbe device circuitry and Silicon Explorer software. Silicon Explorer probes 100 percent of the device



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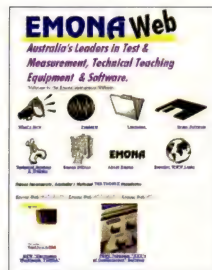
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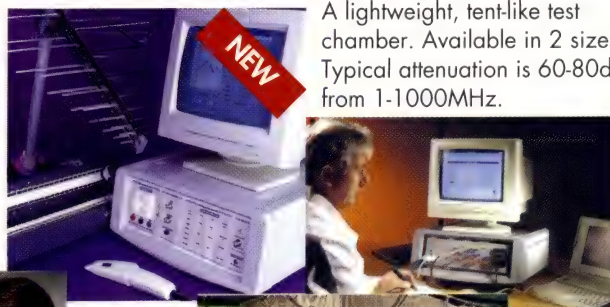
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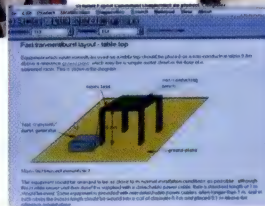


• EASI-SCREEN EMC Test Chamber

A lightweight, tent-like test chamber. Available in 2 sizes. Typical attenuation is 60-80dB from 1-1000MHz.



emissions. The Spectrum Receiver is a PC controlled spectrum analyser with receiver mode and a built-in LISN. Near Field Probe is available.



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• Immunity and surge testing.

• Flicker and harmonics testing.

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• Complies with Australian and European standards (IEC801).

Seaward

PC-Based Instruments

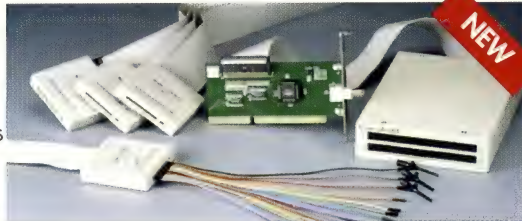
64 Channel, 200MHz Logic Analysers

The new Acute LA1000 Series of high speed PC-based logic analysers operate under the familiar Windows™ 95/98/NT environment, making the instruments both easy to learn and easy to use.

Acute's LA1000 Series includes 4 high performance logic analysers, with 32 or 64 input channels. Sample rate ranges from 100Hz to 200MHz. Available memory depths are 128K or 64K.

Each analyser comes as a complete hardware/software package with instrument mainframe, 16-bit AT Bus PC-interface card, signal isolation amplifier pods, operating software and probes.

The Windows operating software includes a full suite of high performance functions, such as complex multichannel triggering,



variable input threshold setting, timing analysis and state analysis.

As well, facilities such as zoom-in/out, save/load waveforms, output to clipboard or bitmap file, waveform printing and online Help are standard.

Acute

Multimedia CD

Multimedia Teaching of Digital Logic

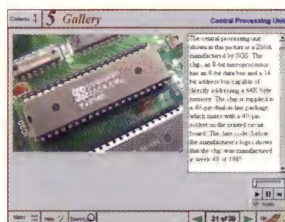
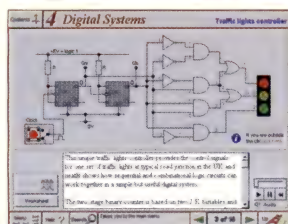
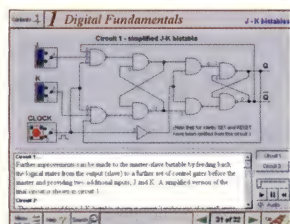
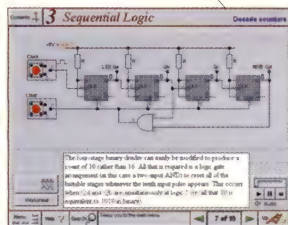
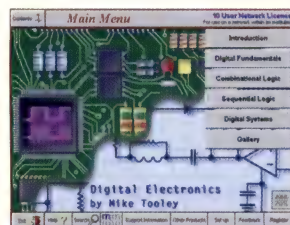
Matrix Multimedia's DIGITAL ELECTRONICS builds on the knowledge of logic gates covered in Matrix's very popular ELECTRONICS CIRCUITS AND COMPONENTS CD ROM and takes users through the subject of digital electronics, up to the operation and architecture of microprocessors.

The on-screen interactive circuit diagrams can also, at the click of a button, be loaded directly into third party circuit simulators, such as Emona's Electronics WorkBench. These virtual laboratories allow the user to manipulate and test the circuits being studied in greater depth.

DIGITAL ELECTRONICS
by Mike Tooley

INSTRUCTIONS:
Insert disk into your CD-ROM drive and from the FILE menu in Program Manager, select RUN. In the RUN dialogue box, type X:\SETUP.EXE where X is the letter of your CD-ROM drive.

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2 models: TDS210: 60MHz at \$1550 ex-tax & TDS220: 100MHz at \$2395; ex-tax

TDS-200 Series Overview -

- **2 Channels** plus viewable Ext. Trigger
- **1GS/s Real-time sampling/channel**
- **Full Dual Timebase** with zoom
- **Auto Setup:** one button autoranging
- **Cursor Measurements**
- **Automatic Measurements:** Frequency - Period - Cycle RMS - Mean - Pk - Pk
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The diagrams below illustrate the difference between scopes with a time-shared digitiser or dual ADCs.



Scope with **Dual Digitisers:** both channels tied to a single test point: reliable display.



Scope with **1 Digitiser:** both channels tied to a single test point: unreliable display!



Four handheld TekScopes to choose from

- | | | | |
|---|---|---|---|
| • 60MHz
THS-710A
True 60MHz single shot bandwidth. Dual ISOLATED, independent channels. | • 100MHz
THS-720A
True 100MHz single shot bandwidth. Dual ISOLATED, independent channels. | • 200MHz
THS-730A
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THS-720P
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Just Compare* -

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Resolution - normal	5,000 counts	4,000 counts
high	50,000 counts	20,000 counts
Bar graph	yes	yes
IEC 61010 rating	CAT III-1000V	CAT III-1000V
DCV accuracy	+/- (0.05% + 1)	+/- (0.05% + 1)
max DC resolution	10µV	0.1mV
ACV accuracy	+/- (0.4% + 1)	+/- (0.7% + 2)
True RMS	AC+DC	AC only
dBm	yes	no
Capacitance	yes	yes
4-20mA process range	yes	no
Temperature range	yes	no
PC interface	yes	no

* Note that the above comparison is indicative only. Please refer to each manufacturer's detailed specifications. Source of Fluke™ 87 Series III information is Fluke™ web site fluke.com as at 8 June 98.



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Tektronix

PROGRAMMABLE LOGIC

circuitry, in real time and at speed, using a high-speed signal acquisition and control tool. Designs can be debugged and verified without design re-layout, greatly decreasing the design iteration process from several hours per cycle to a few seconds.

Application Examples

As an example of the ease with which performance-critical functions can be implemented, figure 2 shows the code and resulting logic for an XOR parity tree. This function will operate in 2.0ns internally, and in 6.6ns measured from input pin to output pin in an SX FPGA. As illustrated, this high level of performance is achieved with behavioural HDL - no architecture-specific code has been introduced.

SX is already being adopted in leading-edge, high-performance applications:

- 8b/10b Encoder for 1Gigabit Ethernet router, 125MB/s sustained data throughput. The designer needed to implement an 8b/10b encoder, and was faced with the prospect of using an ASIC to achieve performance; however, the lead times were unacceptable. No other available programmable logic could implement the design at the specified operating frequency
- 66MHz PCI bus arbiter with 50MHz

sustained data rate. The designer required a programmable logic part to carry out PCI bus arbitration functions. He used an A54SX16-2 to meet the specification with TSU < 3.0ns, TCO < 6.0ns.

- DS3 to DS2 Bi-Directional Converter for Telecom Line Interface Card. The design had to operate at 52MHz, which required register-to-register timing less than 19.2ns. Significant amounts of combinatorial logic between the registers prevented any other programmable part from meeting the timing specification. However, an A54SX16-1 was able to meet the spec.

This new FPGA architecture combines the performance and functionality of multiple CPLDs and FPGAs into a single field programmable device, at a reduced cost-per-gate. It also enables the designer to realise significant reductions in design costs and time-to-market, while delivering the critical performance requirements for next-generation designs. ●

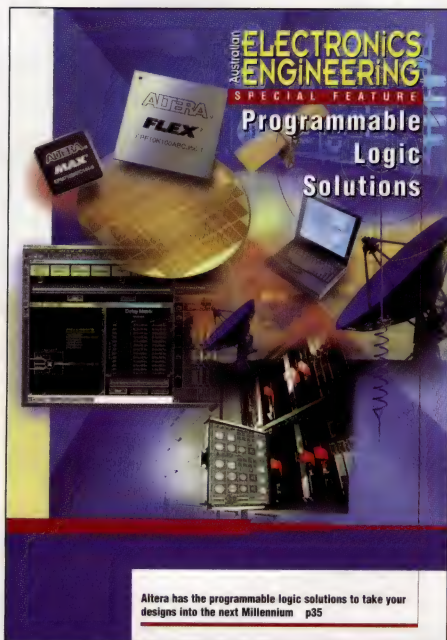
Ken O'Neill is a product marketing manager with Actel Corporation. Dave Wurthman is a high-level design methodology consultant with Actel. The corporation is represented in Australia by Soanar.

Programmable logic solutions

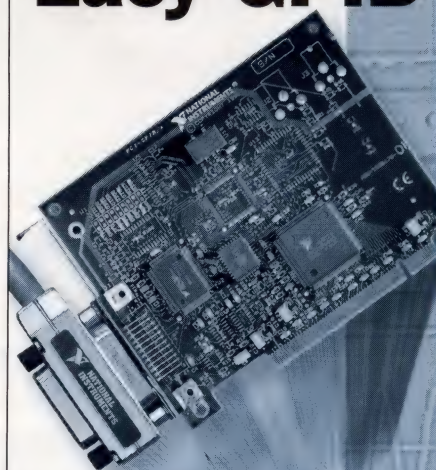
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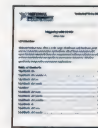
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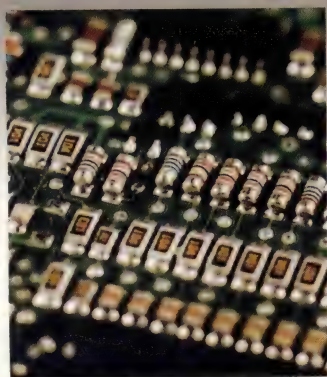
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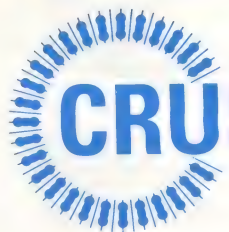
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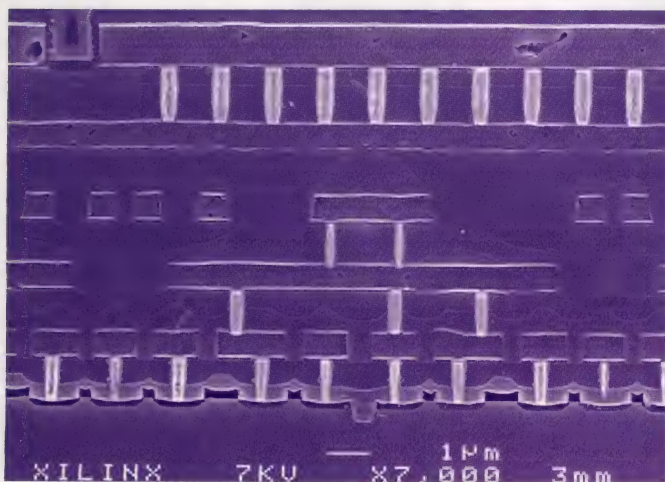
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THE FPGA REVOLUTION

David Schroder looks at the prospects for FPGA technology

Recent advances in programmable logic devices, especially field programmable gate arrays (FPGAs), should be of particular interest to manufacturers of computer and communications equipment. Companies building these products buy approximately two-thirds of all the programmable logic produced today.



An electron microscope view of an XC4000XV chip

On the hardware side, FPGA logic densities and performance are accelerating at a pace never seen before in the industry. State-of-the-art manufacturing processes, meanwhile, have driven down costs to the point that FPGAs are now price competitive with gate arrays, especially at low to medium densities below 40,000 system logic gates. At the same time, new software tools and a growing library of intellectual property (IP) for programmable logic are further simplifying and shortening product development times.

Programmable logic, of course, always has offered flexibility and fast time to market for digital designers. But such

capabilities are especially important — and often key ingredients of success — for businesses that face changing communications and data processing standards, contracting product life cycles and constantly emerging competitors. Such dynamics are making programmable logic an attractive alternative to traditional mask-programmed ASICs

for new products such as fixed wireless systems, PCS base stations, telephony line testers, T1 modem banks, and satellite communication systems.

For many designers, programmable logic devices are suddenly beginning to look more like system-level solutions than convenient pieces of "glue logic".

FPGAs with a quarter million system gates are now available. In terms of

logic density, that's an order of magnitude greater than what was available just two years ago. Devices twice as large are expected around mid-year, and it's likely that the first million-gate FPGA device will be sampling by the end of 1998.

Not long ago, 40-50MHz was the norm for FPGAs. Current devices operate at system speeds in the 80-100MHz range, and the next wave of components, slated for delivery this year, will exceed 150MHz. These devices have the performance to support 66 MHz PCI or a 155Mbps synchronous optical network, communications backbones to which wireless and portable equipment will be connected.

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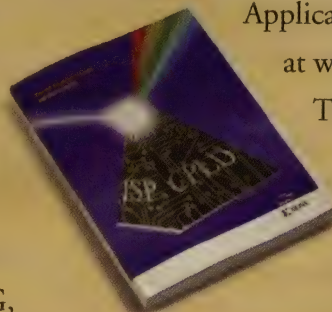
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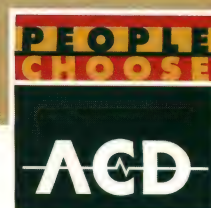
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FPGAs have become a new home for intellectual property (IP), or cores, those predefined system functions familiar for nearly a decade to designers of custom ASICs. These functions - significant design challenges in themselves - are greatly reducing design time for wireless and portable system designers who opt for programmable logic. Expansive new FPGAs, when coupled with cores, are now being viewed by forward looking designers as true system level building blocks.

Today, FPGAs are an attractive alternative for power-conscious designers of portable equipment. While FPGAs are larger and faster than ever before, they are also rapidly progressing down the power curve. During 1997, for example, the industry saw not just the familiar selection of 5V products, but production versions of new 3.3V FPGAs and the first samples 2.5V FPGAs. It's possible that FPGAs operating at 1.8V will reach the market in 1999.

The domain of FPGAs typically has been for high value, low volume applications, that is, for products manufactured in the tens of thousands, or hundreds of thousands, of units. But that is beginning to change. Component suppliers are finding new ways to reduce manufacturing costs, and they are passing the savings on to customers and targeting new low-cost FPGAs at high volume applications. This year equipment designers can expect to see FPGAs offering 5,000 system logic gates priced for less than \$3.

What's going on here? To a large extent, it's a story about an aggressive adoption of the most up-to-date semiconductor manufacturing processes. In the past, programmable logic suppliers were one to two generations behind the process leaders, which translated to 18 months to two years. But that is no longer the case. Leading semiconductor foundries now are eager to use FPGAs to drive their process development because the regularity of SRAM-based FPGA architectures facilitates defect analysis and fault testing.

With their large transistor counts and their minimum spacing between metal layers, FPGAs are an excellent vehicle to troubleshoot the most up-to-date semiconductor fabrication lines.

For example, the smallest member of the new Xilinx XC4000XV family of 0.25 micron, 2.5V, FPGA devices has 25 million transistors on a single piece of silicon. That is more than three times the number of transistors in Intel Corp's Pentium II processor.

The success of deep sub-micron fabrication technology, however, is causing some waves in the world of FPGA design. To take advantage of improvements in device technology, designers must now provide new supply voltages: 3.3V and 2.5V for devices manufactured on 0.35 and 0.25 micron processes, and soon 1.8V for emerging 0.18 micron products. All of this is happening in a compressed space of a few years, and it's in stark contrast to what designers have been used to for the last 30 years, when 5V was the standard supply voltage for digital circuits.

Designers who want to take advantage of the technical and economic benefits of smaller process geometries face several new issues, among them how to generate and distribute multiple supply voltages on circuit board, how to interface between devices with different supply voltages, and how to cope with supply voltage sequencing.

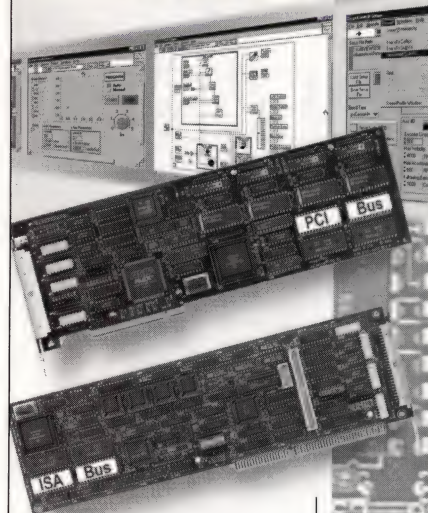
Component suppliers are working to make this transition as smooth as possible through innovative product designs.

Accompanying the rapid pace of change in programmable logic device technology has been a parallel development of software cores, which only recently have begun to make inroads into PLD designs. A number of reasons account for this new migration.

First, programmable logic devices, as already noted, are now large enough to accommodate cores. This has prompted component suppliers and independent IP developers to create cores that target programmable logic devices. These pre-defined and verified cores range from PCI and PCMCIA bus interfaces to digital signal processing (DSP) functions such as finite impulse response (FIR) filters and Fast Fourier Transforms (FFTs). They also include standard peripheral controllers; asynchronous transfer mode (ATM) functions and complete reduced instruction set computer (RISC) processors. Cores for Reed Solomon and Viterbi encoders and decoders, which are frequently used

To a large extent, it's a story about an aggressive adoption of the most up-to-date semiconductor manufacturing processes.

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for error rate calculations in cellular systems, have just reached the market for FPGAs.

The great attraction of cores is that they allow designers to create the most difficult sections of their designs quickly. For small designs, cores are a welcome convenience; for larger, very complex circuits, they are becoming a necessity. With devices becoming so large, it's impossible to imagine meeting a market window by designing one gate at a time. In fact, some designers are incorporating multiple cores into a single device.

Moreover, new tools are on the horizon for 1998 that will make the task of grouping multiple cores on a single PLD device even easier for designers.

Intellectual property developers have traditionally built their cores around standard high level description languages such as VHDL and Verilog, the mainstream tools of ASIC designers that provide a large degree of flexibility. These languages are now becoming the basis for an increasing number of programmable logic tools, and that is one of the many things attracting IP developers to the programmable logic market.

In fact, developers are discovering that FPGAs are excellent prototyping vehicles for cores. Developers can silicon-test their designs directly on programmable logic devices and polish the code much quicker and inexpensively than they could by going through an ASIC vendor and lining up a customer as a development partner. That's because SRAM-based PLDs permit designers to "rewire" the devices immediately by reprogramming them with new designs.

Also, the growing use of PLDs presents independent IP developers, and programmable logic vendors themselves, with a relative "mass market" for their products. Programmable logic customers number in the tens of thousands, compared to a few hundred very large companies that buy IP for their high volume mask-programmed ASICs.

Cores also are helping PLD designers answer the classic make or buy question. Take the PCI interface, for example, the popular bus that's become commonplace in data processing, communications and instrumentation equipment. As ubiquitous as it is today, the PCI interface remains a complex standard rife with timing-critical specifications. "Making" the PCI interface from scratch can add from six to nine engineering months to a design. "Buying," on the other hand, can mean a substantial saving of time and money, especially for PCI designs where engineering time, cost and volume may not justify going to a traditional ASIC solution. Additionally, buying IP frees designers to concentrate on the

intellectual value they add - beyond the basic PCI bus interface - to the product that's on the drawing board.

The Xilinx LogiCORE PCI interface illustrates one model of how cores are being delivered for the programmable logic market today. It consists of pre-defined cores (target and initiator) that allow designers to create a complete PCI interface - customised for their particular application without jeopardising functionality - on a single FPGA and still have ample logic left over on the same chip to create the unique back-end interface logic required for their application.

Two points illustrate why the market has quickly accepted such products like. First, the design is pre-verified and tested, ensuring that it will comply with the rigorous PCI specification. Second, it is a firm core that is optimised for a particular FPGA architecture. Timing for critical paths is fixed, ensuring predictable and consistent performance.

A broader source of cores is emanating from the growing community of independent IP developers. While IP vendors may support multiple product lines from various programmable logic vendors, they are coming to realise that their cores must be tuned for a particular device architecture when maximum performance is required. Power consumption, performance and predictability of the cores that result will vary considerably based on differences in an individual PLD vendor's place and route tools, device interconnect and on chip memory structures.

It is inevitable that design verification and device optimisation will become critical elements for the success of PLD cores, whether they are sold and supported by device suppliers or by IP developers. In fact, independent IP developers are beginning to align themselves closely with programmable logic vendors in order to accomplish just this. Such partnerships help to ensure that cores will reach the customer only after they are verified and optimised and only when a strong support system is in place.

A new momentum is clearly behind programmable logic devices and cores developed specifically for them. During 1998, designers of portable and wireless products can expect to see significant new developments that will make their jobs easier. Larger and faster devices, new FPGA architectures, powerful tools and targeted IP offerings are shaping up to combine cores and programmable logic into true system level solutions. ●

David Schroder is a product manager with ACD in Melbourne. Tel: (03)-9760-4250

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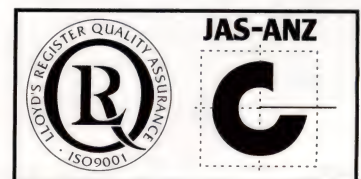
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EMC

EMC — FACING THE CHALLENGE

Ian Graham and Graham Callander
describe the challenge of EMC.

The explosion in the number of electronic products in service today means that the potential for interference between them is growing at an ever increasing rate. In practice such interference is largely prevented by government legislation regulating what is known as Electro Magnetic Compatibility (EMC). This legislation is becoming ever more stringent, and any new product that fails to comply with the EMC regulations cannot legally be sold.

It is now essential that design for EMC now forms an 'up front' part of the system design philosophy, for any new electronic product. Good EMC practice costs little to implement at the outset of

EMI can either be transmitted or received in a radiated form, or may be conducted between separate areas of circuitry by means of connecting cables. The level of EMI produced by an electronic product is covered by the general term 'Emissions', and the tendency of the product to receive EMI is known as its 'Susceptibility'. It should be noted that the 'Law of Reciprocity' applies directly, thus a system designed to minimise emissions will also be the least susceptible to external EMI.

Radiated Emissions

Close attention to layout is the first line of defence in designing for EMC. The requirements of sanitary layout can be summarised in some basic laws of physics, such as Ohm's Law, Kirchhoff's Law, Faraday's Laws and Lenz's Law.

Essentially all of these point to the fact that low speed, low current circuits can be fabricated using the node

approach. In other words, the components can simply be wired together according to the circuit schematic, with any two points in the circuit connected together by conductors being assumed to be at the same potential. This approach does NOT work where high frequencies or high currents are present because the conductors making the connections between components can no longer be considered pure short circuits, as assumed by the node approach. The above laws remind

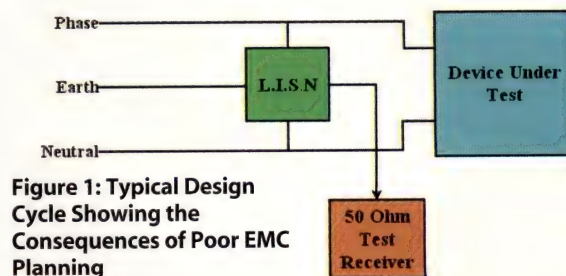
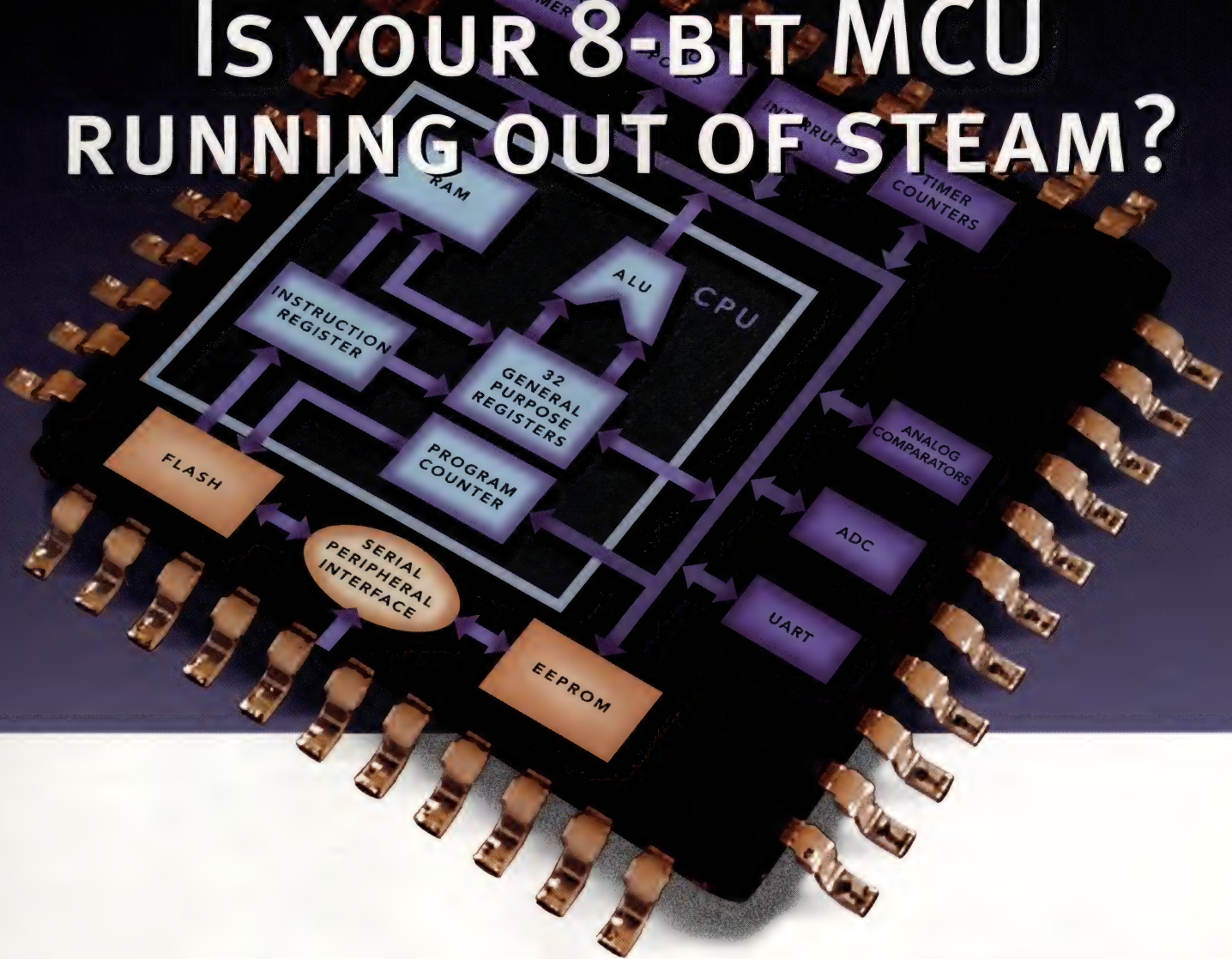


Figure 1: Typical Design Cycle Showing the Consequences of Poor EMC Planning

a product's development, but poor planning often leads to lengthy and expensive re-design at the Type Approval phase. Depending on the severity of any EMC related non-compliance experienced, this can literally be a case of 'start again', as shown in figure 1.

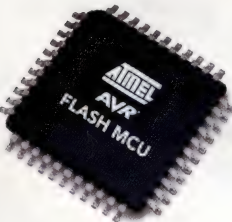
Successful negotiation of the EMC hurdle requires that the mechanisms for generation and reception of Electro Magnetic Interference (EMI) be minimised by design.

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EMC

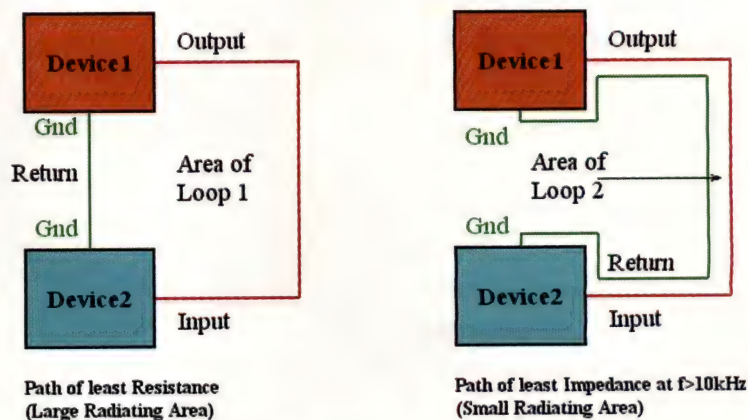


Figure 2: Minimising radiated EMI by layout

us that any conductor will have resistance, self-inductance, self-capacitance, as well as mutual inductance and capacitance to all adjacent conductors. All these properties will affect EMC (not to mention the circuit operation) and must be considered when designing the layout of such systems. This is not an application for your autorouter!

According to Kirchhoff's Laws, each circuit can be analysed into what are known as 'Current Loops'. A particular current loop may, for example, be formed by the power supply, the track-work from the power supply to an active device (amplifier), the load, and the track-work back to the power supply. As any current loop may be treated as a radiator, layout considerations demand that this entire loop be kept as short as possible and have the absolute minimum cross sectional area in order to minimise the level of the radiation emitted. This concept is illustrated in figure 2.

The importance of this can be readily appreciated, given that the magnetic coupling between loops is considerably more interactive than capacitive coupling between conductors. An effective technique for minimising loop area is to overlay signal and return and power supply tracks on adjacent layers of the PCB.

Problems associated with current loops can also arise when heatsinking semiconductor power devices where the tab of the device is live. Given that an insulator is now required to isolate the tab from the grounded heatsink, a capacitor is formed by the tab/insulator/heatsink arrangement. If the power device dV/dt is high, then a current loop is formed via the tab, insulator, heatsink, ground, and back through other circuit components to the tab. This loop can easily have a large area and become a highly effective radiator. In practice the actual radiation may be reduced if the heatsink is left ungrounded and allowed to float.

Where adequate layout considerations

have been applied, the need for shielding may be reduced. However, as circuit densities increase it becomes progressively more difficult to accommodate the layout rules rigorously throughout, meaning that some undesirable current loops are inevitably present. This is especially true where high speed or RF circuits are considered, and so the need for shielding in such circuits is rarely avoidable as it provides a means for containing the radiation produced within an area of a PCB to that area alone. This in turn has a major bearing on the functional reliability achieved by the product, as well as being fundamental to it gaining the mandatory EMC certification.

Conducted Emissions

External wiring, either between PCBs, subsystems, or the outside world must be regarded intimately as part of the system, as it has the potential to completely alter the behaviour of a circuit by introducing unwanted currents. For example, where cabling connects two opposite sides of a PCB, externally generated currents may flow in common earth tracks.

Testing for conducted emissions generally applies only for frequencies up to around 30MHz. Below this frequency, testing for radiated emissions can often be omitted because the radiation would simply be in direct proportion to the cable currents measured during the conducted emissions testing.

For mains powered equipment, the device under test is powered via a Line Impedance Stabilisation Network (LISN). This provides a precise impedance across which the RF voltage may not exceed prescribed levels throughout the swept frequency range and is connected as shown in figure 3.

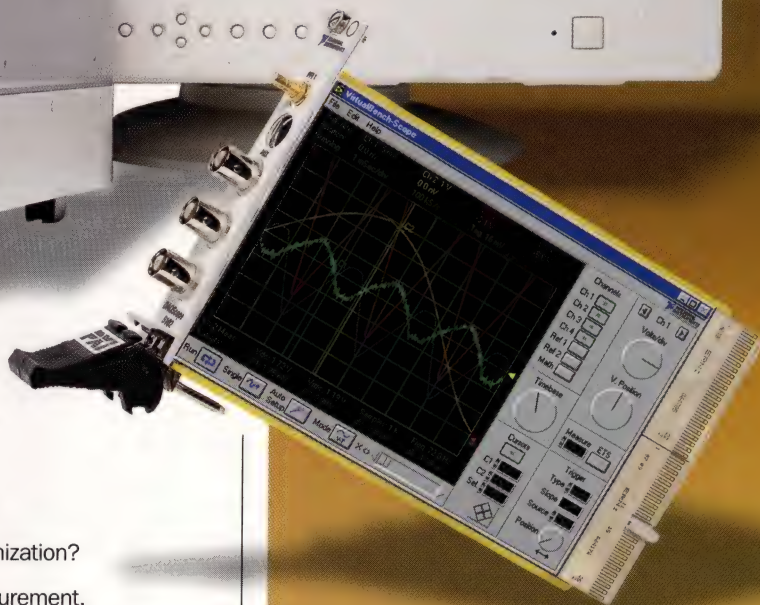
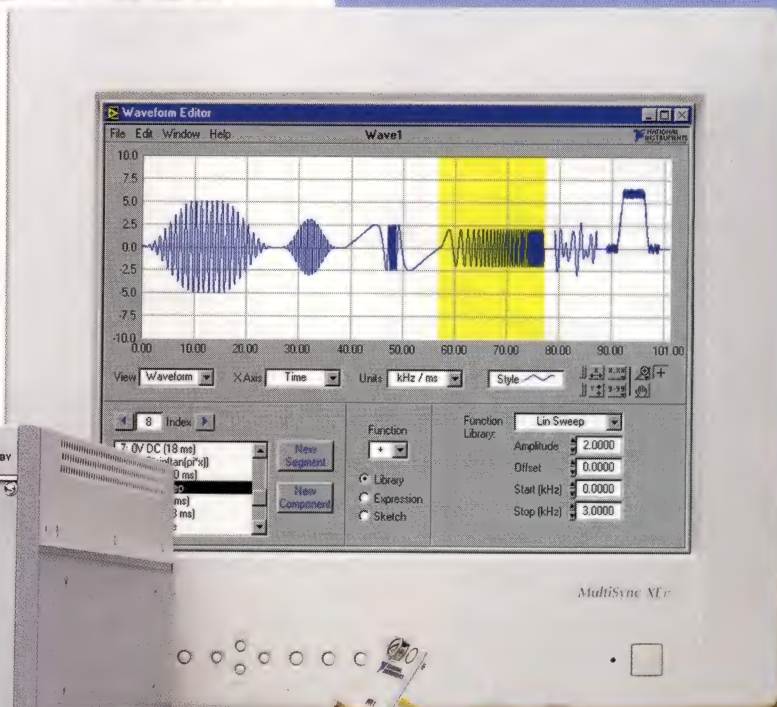
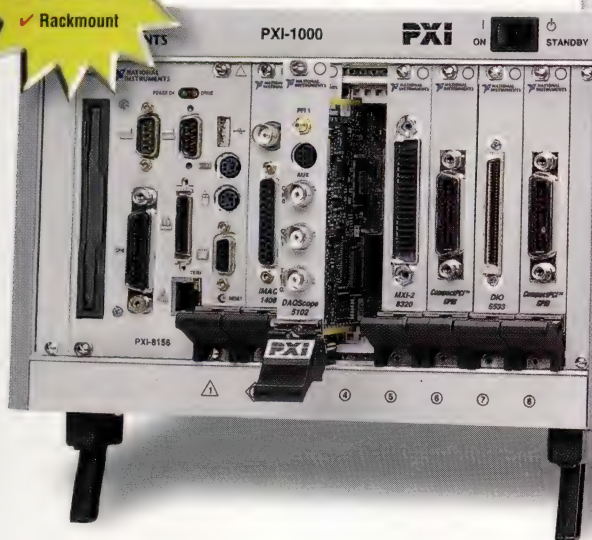
In cases where it is required to test conducted emissions above 30MHz, a special filter/coupling device which can

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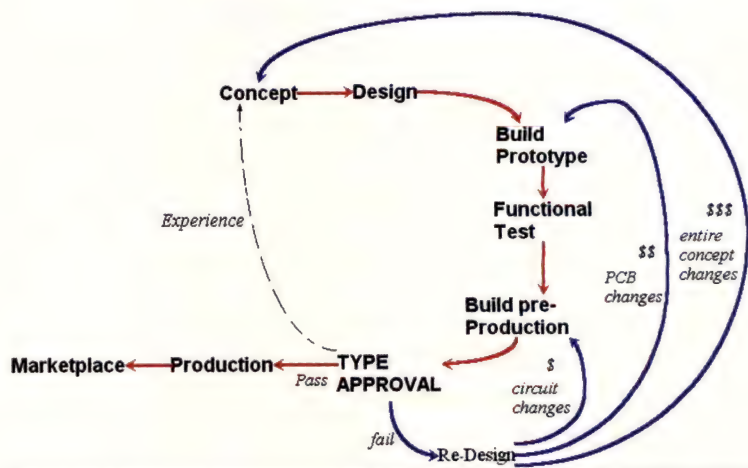


Figure 3: Use of a LISN during conducted emissions testing

be moved along the input and output leads is used to find the point where the standing waves reach their maximum energy.

One very effective approach to dealing with conducted emissions, and their directly related radiating counterparts, is to model active devices within the unit as RF transmitters. The input and output leads (or input leads and the case) of any particular device can be treated as a dipole, and so the aim is simply to reduce the coupling from the transmitter to this dipole. In practice this can be achieved through basic layout precautions and by increasing the impedance of the transmitter with series inductors and suitable decoupling capacitors to ground. The physical relationship of the input and output wiring is fundamental as is the differential and common mode rejection characteristics of the inductors. An upper limit for the mains input capacitors is set by maximum allowable 50/60Hz current flowing in the mains earth line to typically 4.7nF.

Earthing

Earthing is a major consideration when considering the management of EMI, as all potentials are relative. There is no such thing as a true ground; 'Mother Earth' is assigned a potential of zero by convention and convenience only. For example, mains earth is only there for 50Hz fault current protection; the actual earth is many millihenries and milliohms away back through some unspecified mains power wiring.

In general though, some point must be designated as 'ground' for each subsystem present, with connections that must be common being treated so that they do in fact see a common 'ground'.

It would be possible to write an entire

volume on good earthing practice, as an understanding of this subject is so essential to design for low EMI. In fact, it would be fair to say that design for low EMI in high speed (or RF) systems requires a complete reversal of common PCB layout practices whereby the circuitry is laid out first. In such cases, any remaining (randomly distributed) areas of PCB not occupied by circuitry tend, by default, to become the only available 'earth'. Instead, it is paramount to get into a mindset where the earth areas are the first to be allocated on the PCB 'floor plan', with the digital and analogue/RF circuitry then being laid out 'from the ground up'.

Conclusion

The material presented highlights the fact that EMC is a legal requirement, the design for which is becoming ever more challenging given the crowded modern day RF spectrum and the increasing operating speed of electronic circuitry. In order to minimise development costs and time to market, it is essential that this often obscure design requirement is afforded at least as much attention as the more obvious parameters right from the outset. ●

Ian Graham and Graham Callander are with Avnet Design Services (email: design@avnet-pacific.com; web: www.avnet-pacific.com; tel: +64-3-366-0191; fax: +64-3-366-3911).

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NURTURING DEVELOPMENT

When NEC Australia launched its fully automated state-of-the-art surface mount line for electronic components in August of last year, the goal was to use the additional capacity to expand the company's contract manufacturing business.

The \$4 million facility instantly doubled the company's loading capacity to eleven and a half million components a week and gave customers new options, such as the placing of larger or odd-shaped components as well as the implementation of pin-through reflow technology.

Considering the Melbourne-based company's history in all aspects of manufacturing, its push in the potentially lucrative business of contract manufacturing was to be expected. But for Tony Carney, NEC's manager for contract manufacturing, directing expansion has proven challenging.

"Companies shopping for a contract manufacturer are looking for more than an outsourcing arrangement. They are looking for a partnership," he says. "They want to know the manufacturer will take their product on board and nurture its development."

Carney says one of the biggest advantages NEC has is location. Its facility is in Australia. "It is understandable that customers feel insecure when their products go offshore," he says. "Partnership with us means local manufacturing and local consultation and this is important for companies that are committed to Australia and the growth of our industry".

It doesn't mean suffering second best.



NEC's \$4 million surface mount line has doubled the company's loading capacity.

Carney says: "We can offer our customers the most competitive pricing and lead times for components through our network of international purchasing offices and we also offer assistance in design for manufacture and all other aspects of introducing a new product."

The line has received ISO9001, ISO14001 and BABT accreditation. It is also a recipient of the Australia Quality Award and has undergone extensive audits by customers.

The heart of any surface mount process is the solder printer, and the line is equipped with an MPM AP27. It features statistical process control, 2D and 3D inspection, as well as automatic paste application and stencil cleaning. The placement machines are a Panasert MV2F, which is capable of placing up to 36,000 components per hour, and a Panasert MPAV fine pitch precision placer for positioning components down to 0.3mm pitch. Gluing, if required, comes by way of a Panasert HDP3 high-speed multi-head dispenser.

Steve Wadeson is NEC's production engineering manager in charge of the development and implementation of the line. He is particularly proud of a unique

robot, employed to place odd-shaped parts, both electronic and mechanical.

"The robot has fairly simple tooling, but has a very accurate component placement system. This means we can produce tools for odd-shaped parts quickly and cheaply, and place those parts with a very high degree of accuracy", he says. The robot can also supply the force to snap parts

into place if required.

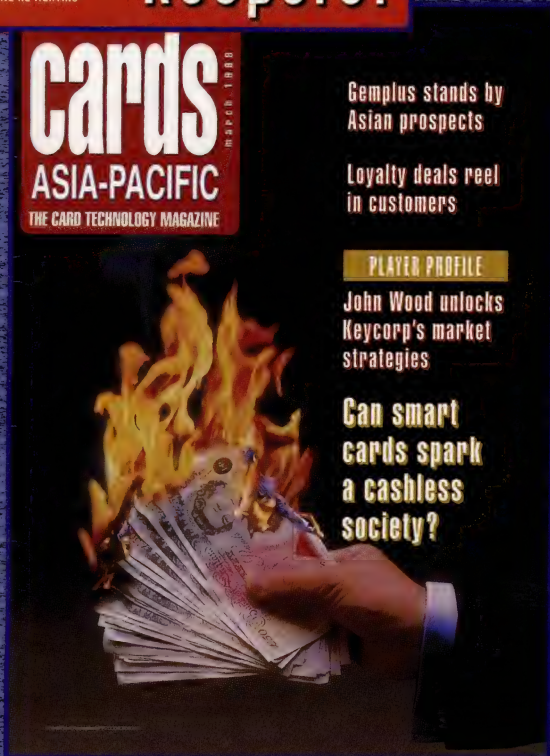
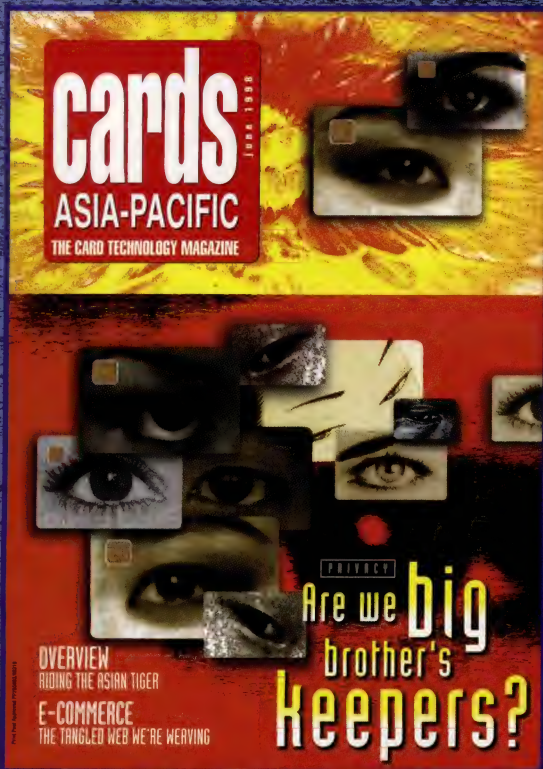
In September last year the Swedish concern Combitech awarded NEC a \$15 million contract to produce 600,000 electronic tags for the CityLink system in metropolitan Melbourne. Daniel Ljunggren, Combitech's project manager, says NEC Australia was selected from seven competitors first and foremost because of price. However he says the overall package they were offered played a decisive role.

"Our first impressions of the facilities and the staff at Mulgrave were very favourable and these impressions have been born out by the excellent working relationship we have established," he says.

According to Ljunggren, Combitech was looking for a long term relationship to maximise the considerable investment they have made in the electronic tag project. "Although price was paramount, the partnership side was a key issue in choosing NEC," he says, "and the option of using NEC's huge worldwide purchasing and manufacturing network very attractive".

Asked for how to advise others looking for a contract manufacturer, Ljunggren suggests customers explore all the skills and abilities the manufacturer is offering.

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RIDING OUT THE CRISIS

Kiwis were catching their breath after absorbing the fact that their current account deficit had climbed to 7% of GDP when the yen started free falling, dragging their dollar down to under 50cents US for the first time in 12 years.

It's been bad news for consumers and importers, but a collective sigh of relief from embattled electronics exporters who've coped for years with an overvalued Kiwi dollar.

It's been scary stuff, with a speech from the Reserve Bank Governor Don Brash at the London Guildhall providing few answers to a lowered fiscal surplus and the developed world's worst net foreign debt relative to GDP. The credit rating agencies have foreshadowed a re-rating downwards of the foreign currency debts. Lower commodity prices are feeding back into a drop in price of rural land. House sales in Auckland in May were 30% down on the previous year.

This has occurred in the short space of six to eight months as the fiscal surplus was eroded by the Coalition Government's big spending plans for health and education and the Japanese yen started to haul the country on the path toward a devalued currency. The current Government under the proportional representation system is an uneasy mix of dry conservative, fiscally responsible economic rationalists — the National Party and the tariff-loving anti-immigrant public-spending New Zealand First Party who have seen their support drop from 17% at the polls to statistical insignificance.

The National Party has recovered from a disastrous slump to about 38% and the Opposition Labour Party is at the same level. The Prime Minister's



Gordon Ferrier

response to the falling dollar has been that the market will provide the adjustment mechanism of higher interest levels and that Government intervention would be a costly failure, pointing to the Australian Reserve Bank supporting the Aussie dollar for no discernible benefit. The Labour opposition has not ventured an answer to the plight except to parade Robert Reich, the former Secretary of Labour in the US as a promoter of the third way: Responsible government investment combined with the market out-comes of production at best price.

All parties agree that the disturbing aspect of the New Economy is the failure to produce the highly educated workforce demanded in the knowledge economy.

There is a possibility that the New Zealand high tech sector will become like Israel in that the domestic economy may be in a slump but the electronics, telecommunications and software export leaders enjoy huge success overseas and become an island of prosperity in a sea of gloom. The wets, ousted in the ideological battles of the 1980s when the fis-

cal fashion was for high public surpluses, tax cuts and leaner government. The subsidies to high tech exporters for marketing research and development have been returning to the political barricades have all gone. The spending by Government on trade promotion is down and the fiscal surplus does not promise a pot of gold even if Government thinking changed. So in the light of the vast Irish expenditure on education, the Israeli investment by Government in pure research and the handy "Investment for Growth Strategy" unveiled by John Howard last December with A\$1.26 billion, including the \$556 million allocation for extra research, the Kiwi cupboard looks bare.

Meanwhile, back in the real world, Steve Sangster, managing director of leading power supply company Innovative Energies, has faxed all and sundry with a list of suggestions of how to ride out the current crisis. He spells out the need to "work together, buy local, be positive, alert, flexible, different and honest," and in a nice little twist, rounds off his message announcing price reductions on his product range. Down south at Tait Electronics, the largest manufacturer of mobile radio systems in the Southern Hemisphere with 90% of its production exported, the decline in the exchange rate is "good news in the long term". Tait's Communications Manager Andrew Trevelyan says the low dollar has to be good for exporters, but worries that inflationary pressures will build up because of higher component import costs.

"We have covered our dollar receipts some way out and when they have caught up we will see benefits from the lower Kiwi," he says.

Surface Mount '98

International Conference on Electronics Design and Manufacture



October 6-9, Melbourne Exhibition and Conference Centre.

The Surface Mount conference celebrates its tenth anniversary this year. And to mark the occasion it has invited three speakers from the original conference, who are still active in the industry, to make new presentations.

James Baker is now senior manager of worldwide process engineering with Sun Microsystems. He has spent the past 20 years involved in surface mount assembly and was part of the team that introduced board level SMT to Motorola. Richard Short is the director of marketing at Indium Corporation. He will share his knowledge of optimising reflow processes. And Steve Vandervoort is an Intel engineer responsible for new process

development at the company's Systems Manufacturing Group where the boards are designed and manufactured.

Also on the bill are two chairs of IPC technical committees. Leonard Roach is the chairman of the IPC-2224 Sectional Standard for Design of PC Cards and co-chairman of the IPC-2225 Sectional Standard for Design of Multi-Chip Modules on Laminate Based Materials. Ralph Hersey was chairperson of the Product Assurance Committee for 15 years. He has been deeply involved in the last several revisions of IPC-A-600, including the "E" revision, and is an authority on the standards and guidelines contained within it. He is currently working on a

training/certification program for the IPC-A-600E.

Conference organisers, the Surface Mount and Circuit Board Association, are expecting at least 300 delegates to attend the conference. Early bird discounts are available for registrations before 14 August. Contact the SMCBA on (03) 9568 0599 or by fax on (03) 9568 0622.

As usual, the conference will be run in conjunction with Elenex, the electrical and electronic industries exhibition, which is anticipating 200 exhibitors and 12,000 visitors. A full preview of Elenex will feature in next month's issue of *AEE*.

SM '98 CONFERENCE PROGRAM

Monday October 5

8.30am — 5.30pm. Surface Mount Rework Course

Tuesday October 6

8.30am — 5.30pm. Surface Mount Rework Course

12pm. Registration

1pm. **Session 1**

Reliability of solder connections — simple approaches

Small and mid range manufacturing

Outsourcing strategies in SM assembly

SMT — A roadmap for the future

5.30pm — 8pm **AGM followed by conference reception**

10am — 6pm. *Elenex*

Wednesday October 7

8.30am — 12.30pm **Session 2**

Low cost solder bumped flip chip technologies for DCA, CSP and BGA

2pm — 5.30pm **Session 3**

BGA process development and implementation

A practical methodology for introducing new technologies

10am — 6pm. *Elenex*

Thursday October 8

8.30am — 1pm **Session 4**

Optimising a surface mount production process

2.30pm — 5.30pm **Session 5**

Optimising reflow profiles via defect mechanism analyses

9am — 5pm **Session 6**

PC Card design to IPC-2224

7.30pm **Tenth anniversary dinner**

12am — 9pm. *Elenex*

Friday October 9

8.30am — 5.30pm **IPC-A-600E Acceptability of printed boards**

9am — 1pm **How to design custom LCDs**

Industry Day — free sessions on a variety of topics

10am — 4pm. *Elenex*

CONFERENCE HIGHLIGHTS

Monday

Prior to the conference proper beginning is a two day *SMT Rework Course*. Topics to be covered include: Introduction to SMT Soldering Techniques; Component Identification; Assembly Safety (ESD, Electromigration ; and Handling); Fluxes, Solders and Solvents; Tools and Soldering Aids; Preparation, Standards, Assembly Requirements; The Soldering Process; Component Removal; Component Replacements; Inspection and Evaluation; Trends in SMT and the Future. The presenter is **Terry Clitheroe** of Solder Technologies. He is a certified IPC-A-610 Class A Instructor with many years experience in soldering training.

Tuesday

The first session will begin at 1pm on Tuesday October 6 with a talk by **James Baker** of Sun Microsystems on *Reliability of Solder Connections — Simple approaches*. Baker has been a process engineer/manager in PCB assembly for over 25 years. His paper is based on the premise that despite the wealth of incredibly detailed scientific data available, there is no unified model that allows an engineer to define or predict the reliability of a solder joint. He will outline some relatively simple techniques for making good (but not perfect) reliability predictions.

Following this **Tom O'Reilly** of Hypertec will discuss *Small and Mid-Range Manufacturing in Australia*. One of the major challenges that all small and mid-range SMT production lines encounter is their inability to generate economies of scale relative to large international competitors. O'Reilly will discuss the strategies adopted for holding market share through flexibility, customer focus through the selective use of JIT principles, offsetting low economies of scale by lowering stock holding and maintaining high quality in the face of lower manufacturing costs from Asia.

James Baker will then return for two more sessions. The first, *Outsourcing Strategies in Surface Mount Assembly*, will focus on the dismantling of existing internal SMT assembly operations and either selling or giving away these manufacturing operations to the 'contract manufacturing' community. SMT assembly is being perceived as a commodity, capable of being provided by

almost any external source. This presentation will provide a view which supports the retention of SMT assembly operations internally rather than contracting it out. The real value of SMT assembly to a company's future will be discussed. And some specific information on when/why to make the decision to 'outsource' SMT will be given.



Tom O'Reilly

The next, *SMT - A Roadmap for the Future*, will look at the idea of predicting, precisely, the packaging technology requirements for a company's products 10 years from today. Some tools and techniques are available based on scientific methods (there are even formulas to help define the probabilities of technology events occurring), some based on trends (literature, industry research, benchmark studies) and some based on extrapolation of the history of product and component technologies. The combination of these tools and techniques will help anyone in forecasting the future of technology.

Wednesday

The second day begins bright and early at 8.30am with a four hour presentation by **Dr John Lau** of Express Packaging Systems on *Low Cost Solder Bumped Flip Chip Technologies for Direct Chip Attach (DCA), Chip Scale Package (CSP) and Ball Grid Array (BGA) Assemblies*. He will discuss the trend in the electronics industry to make products more personal by making them smarter, lighter, smaller, thinner, shorter and faster, while at the same time making them more friendly, functional, powerful, reliable and less expensive. The last few years witnessed an explosive growth in the

research and development efforts devoted to these emerging and advanced packaging technologies. This presentation will discuss vital issues such as the economics, design, materials, process, equipment, quality and reliability relating specifically to this growing industry and address key aspects and questions on CSP, DCA, BGA and solder bumped flip chip packaging and assembly techniques. Dr Lau has more than 26 years of R&D and manufacturing experience in the electronics, petroleum, nuclear and defence industries.

After lunch, Intel's **Steve Vandervoort** will talk on *BGA Process Development and Implementation*. Recently Intel's computer boards began using Ball Grid Array (BGA) package technology for Chipsets and CPU's. This paper will review the use of these packages with practical information for manufacturing. As the industry moves forward, new BGA materials and packaging styles are now appearing in Intel products which has led to additional interconnect and soldering challenges. The Organic Land Grid Array (OLGA) is one such new BGA variation.

Steve has been in electronics manufacturing and process development for 18 years with extensive experience in SMT processes, having installed SMT lines both in the US and in Europe. In the second part of this session, he will discuss *A Practical Methodology for Introducing New Technologies*. Intel uses a Six Step Methodology as one tool intended to provide a consistent approach to process development. In this methodology, development begins with an understanding of the measurement tools that will be used to collect data. Once this is done, development work can proceed, where process capability and stability are established. And finally, process control systems are designed to prevent process excursions. Each of the six steps and their key components will be reviewed.

Thursday

Peter Biocca of Multicore kicks off the day at 8.30am with *Optimising a Surface Mount Production Process*. The surface mount process possesses many variables that need to be considered to achieve reliability and high production yields. Variables that will affect both quality and yields will be found at the solder paste selection level; at the print

process; pick and place process and the reflow oven set-up. Another important variable can be the overall solderability of the parts to be soldered, the component terminations and printed circuit board finish. The presentation will discuss world trends in assembly, solder paste chemistry selection, printer set-up and the reflow process requirements to reduce and prevent future soldering defects. Biocca has over 15 years experience in soldering chemistries and alloys and is an active member of IPC and ASM.



Rick Short

At 2.30, Indium Corporation's **Richard H. Short** presents a paper on *Optimising Reflow Profiles Via Defect Mechanism Analyses*. New knowledge of defect mechanisms, combined with the enhanced capabilities of modern reflow equipment and materials enable SMT engineers to optimise their reflow profiles based on their specific requirements. Topics to be discussed include ramp-up rates, "soak" zones, peak temperatures, cooling rates, hot slumping, bridging, tombstoning, skewing, wicking, voiding, solder-balling, grain structure, component cracking.



Leonard Roach

Running parallel with these sessions is a full day course covering *PC Card Design to Assembly (Using IPC-2221 and 2224)* presented by **Leonard Roach** of Lucent Technologies/Bell Labs. This

course will provide designers and developers with the key principles and understanding of PC Card design, manufacturing and assembly techniques to enhance rapid product realisation. Topics to be covered will include Design for X; Time to Market, Past, Present and Future PC Cards; Roadmaps for components, substrates and assembly.

Friday



Ralph Hersey

The final day begins with a free workshop on *How to Design Custom LCDs*. Presenters will include **Johnny Chung-Lim Chou**, founder and director of Clover Display and Compucon Computers; **Shin-Hung Chiu**, general manager Manufacturing at Clover Display; and **Professor Long-Pei Shi**, chair of the Microelectronic Research Laboratory at Chung Shan University, China.

For those seeking a fuller Friday, **Ralph Hersey** of Ralph Hersey and Associates, will present a workshop on *Acceptability of Printed Boards using IPC-A-600E*. From 8.30am to 5.30pm, Hersey will present the most significant results of an industry-wide effort to establish acceptable printed board manufacturing standards based on technical requirements. This course identifies and discusses the more critical design manufacturing and acceptance requirements for printed boards and forms a baseline of technical requirements and understanding between engineering, design, manufacturing, quality, material, procurement and management personnel.

Hersey is a former chairman of the IPC Product Assurance Committee with more than forty years experience in the industry and has been involved in every revision of the IPC-A-600 to its current Revision E and is recognised by the IPC as an authority on the standards and guidelines contained within it. ●

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A COMPREHENSIVE GUIDE TO THE AUSTRALIAN MICROPROCESSOR MARKET

Our second microprocessor guide this year is even more comprehensive than before. This new version of the guide has been updated to reflect company name changes, and changes to the distribution channels of some products.

MicroProcessors	Distibutor	Phone	URL
AMD	Avnet-Pacific	02 9878 1299	www.avnet-pacific.com
AMD	Zatek	03 9574 9644	www.zatek.com.au
Atmel	GEC	02 9638 1888	www.gec.com.au
Atmel	Insight	03 97627644	www.memecebv.com.au
Cirrus Logic	Braemac	02 9550 6600	www.braemac.com.au
Cypress	Braemac	02 9550 6600	www.braemac.com.au
Crystal	Braemac	02 9550 6600	www.braemac.com.au
Dallas	Veltek	03 9574 9300	www.veltek.com.au
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Echelon	Avnet-Pacific	02 9878 1299	www.avnet-pacific.com
Echelon	Veltek	03 9574 9300	www.veltek.com.au
Holtek	GEC	02 9638 1888	www.gec.com.au
Harris	Avnet	02 9878 1299	www.avnet-pacific.com
Hitachi	Insight	03 9762 7644	www.memecebv.com.au
Hitachi	Hartec	02 9870 3300	www.hartec.com.au
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Hitachi	Tenrod	02 9748 0655	www.tenrod.com.au
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IDT	GEC	02 9638 1888	www.gec.com.au
Intel	Intel Australia	02 9937 5800	www.intel.com.au
LG Semicon	GEC	02 9638 1888	www.gec.com.au
MicroChip	Avnet	02 9878 1299	www.avnet-pacific.com
MicroChip	Zatek	03 9574 9644	www.zatek.com.au
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Mitsubishi	Tenrod	02 9748 0655	www.tenrod.com.au
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Motorola	Veltek	03 9574 9300	www.veltek.com.au
Motorola	Future Electronics	03 9899 7944	www.future.com.ca
National Semiconductor	Avnet	02 9878 1299	www.avnet-pacific.com
National Semiconductor	Hartec	02 9870 3300	www.hartec.com.au
National Semiconductor	ACD	03 9763 4788	www.memecebv.com.au
NEC	Soanar	1300 365 551	www.soanar.com.au
Philips	Passive Electronics	03 9561 6288	www.mcvan.com.au
Philips	Soanar	1300 365 551	www.soanar.com.au
Siemens	ACD	03 9763 4788	www.memecebv.com.au
SGS Thomson	Veltek	03 9574 9300	www.veltek.com.au
ST Micro Electronics	Braemac	02 9550 6600	www.braemac.com.au
Sun	Sun Microsystems	02 9844 5000	www.sun.com
Sybiosis	Braemac	02 9550 6600	www.braemac.com.au
Temic	Avnet-Pacific	02 9878 1299	www.avnet-pacific.com
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NEW PRODUCTS

Small dc-dc converter



Ericsson has launched the PKF 4000A I series which it claims is the world's smallest 2A dc-dc converter. The first model, the PKF 4111A, provides a fully isolated 5V at 2A output in a 48x24mm footprint.

The series is targeted at decentralised 48V and 60Vdc power systems and is available in both SMD and through-hole versions. Full output is achieved without heatsinks or forced cooling making it suitable for applications in IT and telecommunications systems. It has

been designed to provide low EMI, both radiated and conducted, when measured in accordance with VDE, FCC and CISPR standards.

The low profile package enables board spacing down to 15mm and it is suitable for temperature in the -45°C to 100°C range. Users can adjust the output voltage from 4.3V to 5.8V with an external resistor. Facilities are also included for remote control and synchronisation of switching frequency to an external TTL signal between 520kHz and 688kHz.

Enquiry number: 1217

Imaging software

The Dindima group has announced the release of version 2.2 of its scientific and industrial imaging software Matrox Inspector. It has been optimised for MMX technology. Typical applications include off-line industrial inspection, microscopy, med-

ical visualisation, image cataloguing and biological analysis.

The package contains a complete set of functions for image capture processing, blob analysis, gauging/measurement and pattern recognition/matching.

Enquiry number: 1297

Low voltage op amps

Veltek has released the Maxim MAX4240-MAX4244 series of single/dual/quad low-power, low-voltage op amps. They provide 90kHz gain-bandwidth products while drawing 10µA per amplifier.

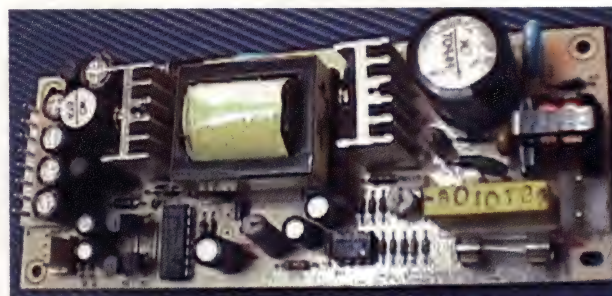
The op amps operate from a single supply of 1.8V or 5.5V or dual supplies of ±0.9V to ±2.75V. The MAX4241 and MAX4243 have a shutdown mode that places the outputs in a high impedance state and reduces the supply current to

1µA. The input common mode extends 200mV beyond each rail and with 100kΩ loads the outputs typically swing to within 8mV of each rail.

The single MAX4240 come in a SOT23-5 package and the single MAX4241 in an 8-pin µMAX package. The dual MAX4242 comes in an 8-pin µMAX or SO and the dual MAX4243 comes in a 10-pin µMAX or 14-pin SO. The quad MAX4244 comes in a 14-pin SO.

Enquiry number: 1233

Power supply supports VFDs



Statronics has released a full-range power supply for industrial and consumer products featuring 6 outputs. Outputs provided are 5V at 2.5A, +12V at 1A, -12V at 0.3A, -25V at 0.1A and a two-phase, 3.5V RMS centre-tapped and biased output for the fila-

ment drive of vacuum fluorescent displays.

Further features are an input range of 90V to 270V RMS, compliance with international safety and EMC standards, high efficiency, and a compact size of only 150 x 60 x 29mm.

Enquiry number: 1235

For more information on any of the products or advertisements in this issue, visit the AEE website www.aee.com.au

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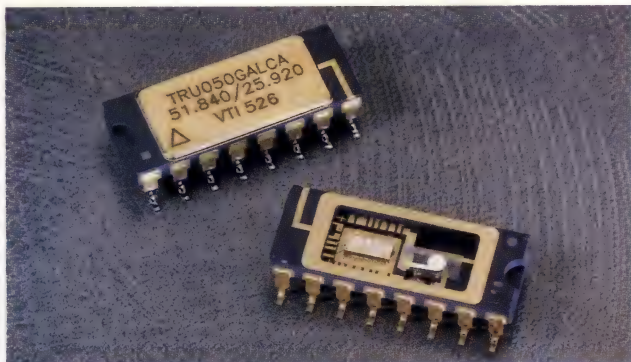
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PLL solution



The Vectron TRU-050 phase lock loop (PLL) solution is available from Zatek. It is an ASIC with a quartz stabilised VCXO that performs clock recovery and data retiming, clock frequency translation and clock smoothing functions.

Because the VCXO incorporates a high Q crystal, the output jitter is less than 20ps. The input data ranges from

8kb/s to 65Mb/s and the output has a tri-state option. The supply voltage can be either 3.3V or 5V and it is packed in a hermetic 16-pin ceramic DIL with a surface mount option.

It is suited to applications in ATM, SONET/SDH, XDSL, network communications, digital audio/video and PVX systems.

Enquiry number: 1240

Thermal printers

Avnet Pacific has a range of Seiko thermal printers for use in electronics applications.

The LPT1245 is a compact lightweight thermal line printer powered by lithium-ion batteries. It is capable of printing at a maximum speed of 62.5mm/s. It has a high resolution on a paper width of

58mm and requires 5V to run at low currents. It is suited for use with various kinds of portable compact devices such as hand-held data loggers, desk top data loggers, industrial calibration gear, portable test equipment, taxi meters, etc.

Enquiry number: 1299

Documenting process calibrators

MB&KJ Davidson has released the Druck DPI610 pressure documenting pressure calibrator and TPX II multi-function documenting process calibrators. Menu-driven and multi-language, they can simulate, source and measure a variety of process parameters.

Both instruments incorporate a clear, task-oriented dual display, which can be configured according to the application. Test results may be stored in non-volatile memory and transferred to a PC system for further analysis via an integral RS232 port or PCMCIA card. Up to 400 calibra-

tions can be stored on each 1MB card.

With a hand pump, the DPI610 is able to generate, measure and display pressures and vacuums, as well as loop currents and test voltages. Standard display tasks include transmitter, transducer, valve, switch and leak testing. The TRX II can measure, source and simulate thermocouples, RTDs and temperature transmitters; source and measure volts, current, ohms, frequency and pressure; and perform datalog, ramp, step, scale, switch, pulse and counter/totaliser functions.

Enquiry number: 1227

IDC connectors

Soanar has released Pancon MAAS-CON 0.1 and 0.156in pitch IDC connectors. They are used to bring signals or power to a printed circuit board using discreet wire or pre-notched flat cable.

Connectors are offered in the Circuit End (CE) and Circuit Through (CT) styles with colour coded ribs for AWG size identification. Contrasting dots below ribs are also used to identify the CT connector,

which is used for daisy chain applications.

Optimum connector performance is provided by the IDC contacts piercing the insulation of each wire on two sides to make four gas-tight connections. Contacts are copper alloy with tin over nickel plating. The connectors are UL listed and CSA certified, and are capable of currents up to 12.5A.

Enquiry number: 1236

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Enquiry No. 1339

NEW PRODUCTS

Operator interfaces



The Red Lion Paradigm series is now available from Pryde Measurement. It provides a range of operator interface panels for use with PLCs and micro-PLCs.

Using EDICT-97 software, the Paradigm can talk to most PLCs on the market as well as variable speed dri-

ves, bar code readers, weighing systems and intelligent panel meters. It provides historical trends and date-time stamped records of plant activity. The interface are available with backlit

vacuum fluorescent display. The display size ranges from 2 x 20 characters to 4 x 20 characters. User software is stored in 64K battery-packed RAM. Serial ports include RS232 and RS485 for PLCs; and RS232 for printers and modems. The interfaces are IP65 rated.

Enquiry number: 1239

SRAMs for networking

Avnet Pacific has introduced a 4Mb flow-through synchronous Zero Bus Turnaround (ZBT) SRAM that it says is the world's fastest. The Integrated Device Technology chips are suitable for performance-driven networking products, such as switches and routers, that require memories with both high bandwidth and the capability of

intermixing read and write operations.

The IDT71V546 (pipelined version) and IDT71V547 (flow-through version) are 3.3V ZBT SRAMs with 128K x 36 configurations. The 71V547 operates at 100MHz with an 8ns clock-to-data access time. The 71V546 pipelined device operates at 133MHz with a 4.2ns clock-to-data access rate.

Enquiry number: 1298

Gerber software

Satcam has released version 5.0 of the Advanced CAM Technologies CAM350 family. The software package for viewing, editing and manipulating Gerber files comprises the CAM350, ECAM, PCGerber and GerberView.

New features in the family include: bed of nails test fixturing; manufacturability check to find acid traps, slivers, etc; oversize/undersize any-shaped

polygon; direct CAD system interface from Zuken-0Redac; netlist extract handles blind/buried vias; and full BASIC support has been added to the macro language.

A system of graded access codes allows users to pay for only the levels they need, but also to upgrade as the need arises.

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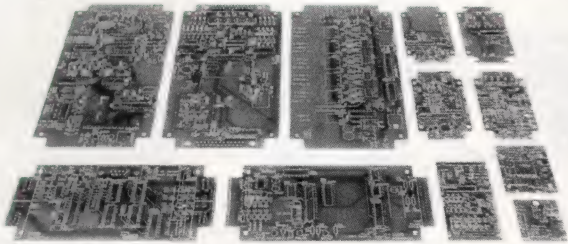
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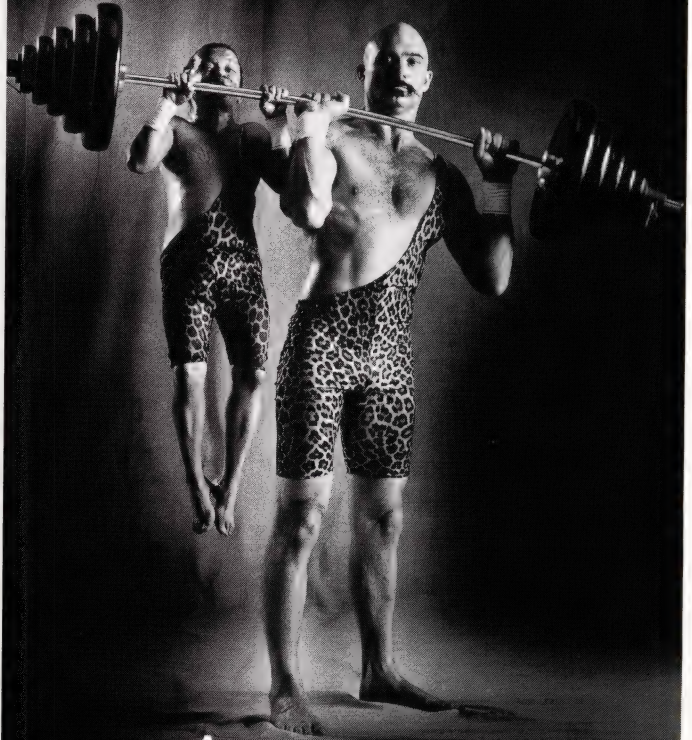
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Enquiry No. 1343



Surge reduction system



Eltek Pacific has introduced the Panamax Towermax KSU 240V surge reduction system. Designed for Australian conditions, it is C tick approved and provides protection for telephone key systems, small PBXs and mini computers against power and lightning related disturbances.

The modular design of the system makes it possible to protect all incoming

communication and power lines coming into the telephone or computer system. The base ac protector has a thermal fuse to shut off power connected to the equipment in case of extended over voltage; a 10A circuit breaker and an on-off switch. It has a 700V clamping level and the ability to handle an unlimited number of non-catastrophic surges.

Enquiry number: 1238

Analogue switches

Siliconix, represented in Australia by Braemac, has cut the size of its most popular analogue switches by more than half with the introduction of a new TSSOP-16 package option. The devices have a footprint of 6.4 x 5.0mm and a height profile of just 1.1mm. They are suited to cellular phones, portable data acquisition instruments, portable automatic test equipment, and battery-powered systems.

Available in the TSSOP-16 package are the DG201BDQ, DG201HSDQ, DG202BDQ, DG211BDQ, DG212BDQ, DG213DQ, DG308BDQ, and DG309BDQ.

These general-purpose quad analogue switches are built on a proprietary high-voltage silicon-gate process.

The devices combine low on-resistance, leakage currents, and charge injection with fast turn-on times.

For example, the DG201BDQ and DG202BDQ offer on-resistance of 45Ω, with a 120ns turn-on time and 1pC charge injection.

The high-speed DG201HSDQ offers on-resistance of just 25W and turn-on-times of 38ns. The other analogue switches offer similar improvements in all key specifications compared with industry-standard devices.

Enquiry number: 1228

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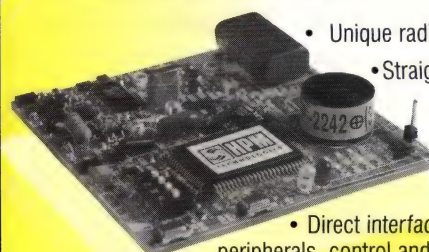
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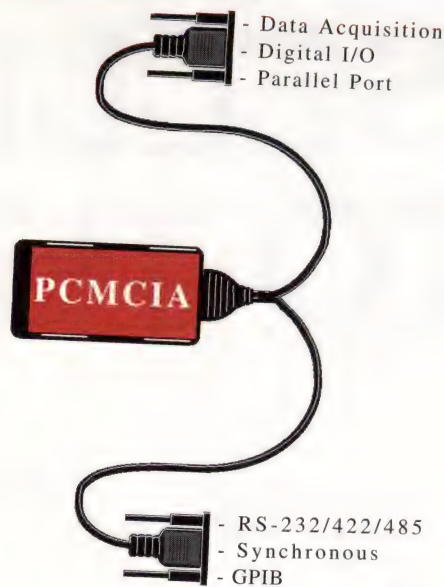
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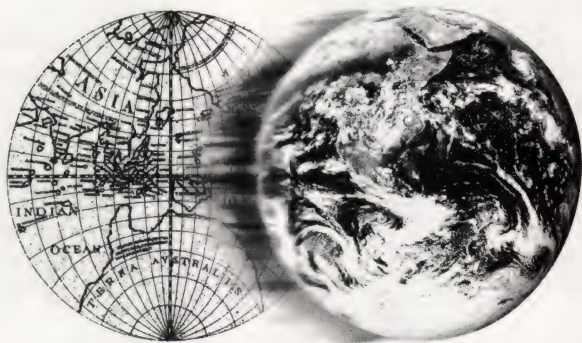
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SELLING CHIPS TO THE MASSES

Kenneth Kim — IMD

The biggest news five years ago was that IBM, for so long the master of this part of the universe, was on the nose, a victim of its own arrogance as much as a swag of upstarts snapping at its heels.

But five years is a long time in the computer business — long enough to reinvent an entire company.

That IBM has done this, and done it with conspicuous success, was bought home by the recent visit of Dr Kenneth Kim to Australia. Kim is the Asia Pacific director of IBM Microelectronics Division (IMD). After a PhD from Columbia, he cut his teeth with Motorola Corp, rising to head its Asia Pacific division. He joined IBM in 1996.

His brief is to lead the IBM attack on the \$21 billion custom chip industry. The industry is expected to grow to \$52 billion by 2002, so a significant slice of this is worthwhile in anyone's language.

IMD started life as the microelectronics division of IBM, tasked with developing integrated circuits to run its range of computers and peripherals. Today it is an independent company selling a huge range of custom logic to all and sundry. "We don't even have IBM itself as a guaranteed customer. We have to compete on an even basis with everyone else for its



Asia Pacific director of IMD, Dr Kenneth Kim (right), with newly appointed regional sales manager John Robinson.

business. Sometimes it's even harder for us to make a sale into IBM than for outsiders", Kim laments.

About 60% of IMD's total revenue still comes from IBM, but a growing proportion comes from outside. He says that by the year 2000, the proportions will have reversed, and IBM itself will account for only 40% of total sales.

Even so, IBM Microelectronics is now one of the leading providers of customised logic. In total world wide sales it ranks second only to NEC.

The shift began in 1992, when IBM reconstructed its micro-electronics division as a separate cost centre. Its first move was to sell memory chips and other

types of commodity products in which it had superior or competitive technology. However, the company ran right into the chronic glut in memory production capacity that occurred in the early 1990s. The experience was enough to convince IBM that its expertise was not going to be in shifting millions of items at a few cents each. Rather, it was going to be in shifting its considerable intellectual capital, in reasonable numbers, but with a tremendous amount of value added.

Hence its move into customised logic. The company still sells a wide range of memory products, but IBM's strategy, as Kim tells it, is to sell application specific circuits with as much on-board IBM intellectual property as possible. This starts with complete applications on the chip — the company has recently completed a GSM phone chip and a set top box chip for cable TV applications, all the way down to ICs that contain nothing but the customers own intellectual property. Predictable, most of the demand is for ICs in the middle range, where IBM can supply modules that represent part of a total solution.

It currently has 25 different cores, including a PowerPC which can be inte-

grated with the customer's own interface logic, a picoJava core, for customers who wish to build Java compatible hardware, as well as for a digital signal processor with functionality identical to the industry standard Texas Instruments TMS320C54X. This is in addition to a host of lower-order logic modules designed to take the pain out of designing ASICs.

But this design ability is only half of the story, according to Kim. He says a second part of the attraction of IBM is in its technology. This now includes the ability to deliver track width of 0.18 microns, which he says, is close to the fundamental limit at which further decreases in track width cause increases in line capacitance, so slowing down the circuit. Smaller track widths allow more devices on the die, but the two effects tend to cancel each other out. A move to copper interconnects has improved matters somewhat, but the improvement has only been incremental.

He says a more important design advance has been the move to low power design, which means customers can reduce battery size, or alternatively increase battery life, in small portable devices. In desktop devices, it means power supply or cool-

ing requirements are reduced. Either way, it means that the total cost of the item can be reduced substantially.

Kim says IBM is now attacking three market segments. It retains its interest in computing, and still makes the majority of the significant chips in IBM computers, from mainframes through to desktop PCs. "This is a significant source of intellectual property in its own right, which we can use to develop cost effective solutions for other customers", he says.

The company has also developed an interest in communications devices, hence a recent deal with CommQuest, which has delivered industry-leading wireless communications technology.

The third market segment is the consumer electronics market. This market segment has been the most significant driver of its business in Japan and Korea, where the majority of consumer electronics originate.

Kim is visiting Australia because he is anxious to increase the company's slice of the Australian marketplace. He says a number of IBM's most significant customers have established design factories in Australia, and it is imperative that IBM get close to the designers in order

to get its products specified at the appropriate time. He says most of this demand will be in the communications sector, although he is on the lookout for demand from any part of the market.

The company has no desire to establish either a fabrication plant or a design facility in this part of the world. He says the existing design centres are not geographically focussed anyway, but rather have expertise in different areas.

As for fabs, he says the company is already adequately serviced by its network of fabs in the US, Europe and Japan, and does not require any others. He says the economics is so challenging that building new ones is increasingly problematic. "Moore's Law still operates. That is, computing capability doubles roughly every eighteen months." The implication is that so does everything else — the number of artefacts in a single IC, the difficulty of building an IC without error, the amount of money required for investment. The only thing that is not increasing is the payback time.

Even with all this difficulty, however, there is no doubt that there is a pot of gold awaiting those who can do microelectronics successfully. ●

RF SHIELDING GASKETS

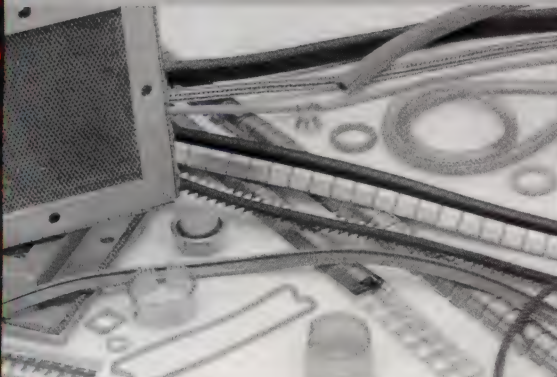
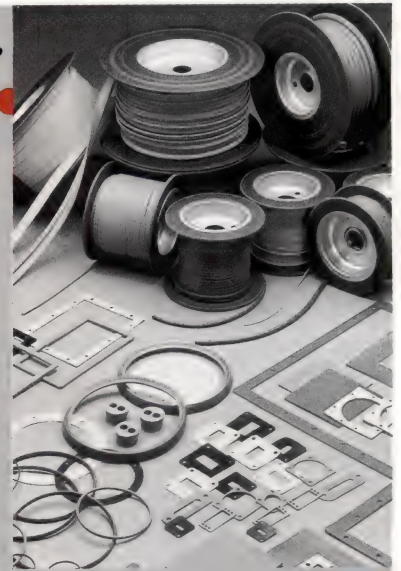
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Manufesto 98

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MICROCONTROLLERS and the Design Engineer

A roadmap to the **digital solution**
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If your products aren't "smart" today, you can bet they will be tomorrow. That's because your customers will demand it. Here's how to build intelligence into your designs and take advantage of the Mechatronics Revolution.

In autos and appliances, in computers and communications devices, and in almost every other consumer, business, and industrial product category, customers are getting more performance features per dollar each year.

Consider a laptop computer: Today's model is lighter and faster than its predecessors but packs a more spacious memory, a far larger disk drive, a faster modem, a built-in CD-ROM or DVD, and a longer-lasting battery. Likewise, today's digital watches sport features such as electronic compasses, thermometers, and even infrared communications. Why does there so often seem to be something new? Because competition makes it mandato-

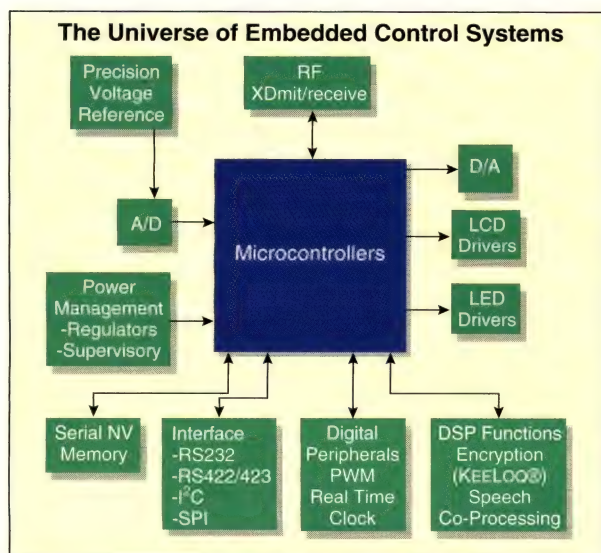


ry for manufacturers to keep up the pace, and because advances in semiconductor and related technologies make product upgrades easier than ever.

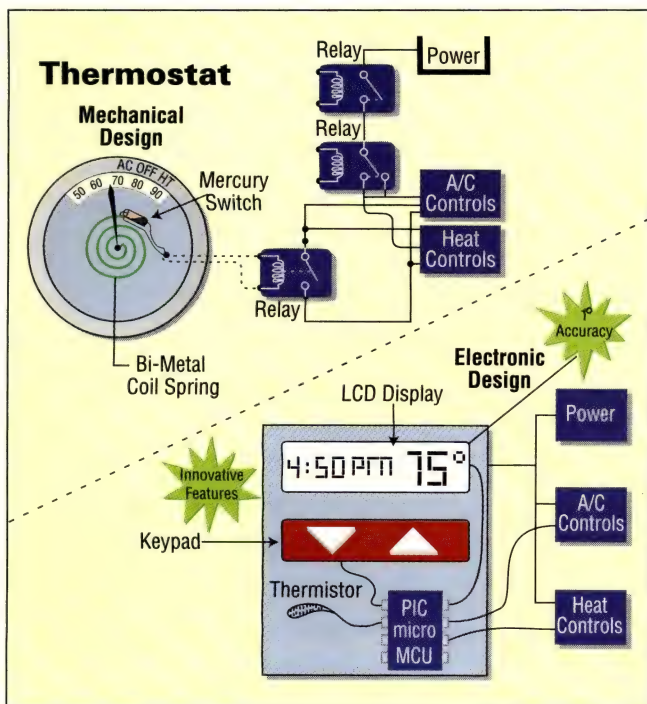
If customers can expect more from their computers and their digital watches, why shouldn't they expect more from their hair dryers and coffee makers? If they can turn on a television (using a features-rich remote controller) and watch a channel aimed at their demographic profile, why shouldn't the products that punctuate their lives be equally eager to please?

GET SMART

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NEED HELP GETTING STARTED?

consistent product quality and reliability. Third, there is literally no price premium for using a PICmicro. Fourth, PICmicro-based products require less time/cost in manufacturing, and finally, Microchip Technology offers a full suite of development tools, documentation, and worldwide support you need to get started and to stay current.

To illustrate the benefit of designing with an MCU, consider the curling iron, thousands and thousands of which are sold every year. For years its functionality was limited to a mechanical on/off switch. Today's models feature a digital on/off switch and three different heat settings. What's more, this smart hair curler shuts itself off automatically if left unattended, then heats up quickly when it's picked up for further use. Consumers who inadvertently burn themselves on the original design won't mind paying a few cents more for the additional features. Coincidentally, while using a PICmicro MCU, this improved product costs the curling iron manufacturer less to make. That's profit he'll take to the bank. The cost savings add up quickly as this single sliver of silicon

Microchip Technology has application engineers throughout the world ready to provide hands-on assistance. Contact Microchip directly to receive a fact-filled Mechatronics PowerPak with complete technical information. Help is also available from Microchip distributors, who must undergo stringent certification procedures. Their training and know-how can help provide a smooth path through the entire PICmicro design process. Arm yourself for winning in the Mechatronics Revolution. There is no reason to wait any longer.

Potential Applications for the PIC12CXXX

- Battery chargers
- Electric motors
- Hair dryers
- Remote sensors
- Security systems
- Toasters
- Clocks
- Electric shavers
- Pointing devices
- Rheostats
- Thermometers
- Toys
- Gas detectors
- Remote controls
- Rice cookers
- Thermostats
- Wristwatches
- Curling irons

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With so much demand for smarter products, sales of MCUs and non-volatile memory are soaring. Microchip has already shipped more than half a billion of its PICmicro™ family of 8-bit RISC (reduced instruction set computing)-based MCUs, nearly three-quarters of a billion EEPROMs, and more than 100,000 application development systems.

THE MECHATRONICS REVOLUTION

We are living through a revolutionary period that is impacting almost every aspect of our lives. The nature of the revolution is the momentous shift from analog/electro-mechanical timing and control to digital electronics. It is called the Mechatronics Revolution, and it is being staged in companies throughout the world, with design engineers right on the front lines: Make it smarter, make it smaller, make it do more, make it cost less to manufacture – and make it snappy.

GET WITH THE PROGRAMMING

Microcontrollers and the variety of program memory technologies are the guns and powder that define the Mechatronics Revolution. Memory technologies include ROM (read-only memory), OTP (one-time programmable), EEPROM (electrically erasable read-only memory), and Flash memory. The leaders of the Mechatronics Revolution are the design engineers who master these MCU options and make the right choice for their particular embedded system applications. The real victors of the Mechatronics Revolution are the consumers who purchase today's and tomorrow's smarter products.

THE WORLD'S FIRST 8-PIN MICROCONTROLLER

To meet the needs of this growing customer base, Microchip is rapidly expanding its already broad line of 8-bit PICmicro MCUs. The most recent addition, the PIC12CXXX family, is a major breakthrough – it's the world's only 8-bit OTP microcontroller with just 8 pins. Their size, roughly that of a thumb tack, opens up new

Pick the PICmicro that's right for your application

In addition to the PIC12CXXX, Microchip's PICmicro MCU family includes the baseline 18-28-pin PIC16C5X family, with low voltage (2.5V) that makes it ideal for battery-operated systems; the mid-range workhorse PIC16CXXX, which is rapidly becoming the industry standard for performance and versatility in 8-bit applications; and the PIC17CXXX, featuring a 16-bit instruction word and performance rivaling that of a more expensive 16-bit microcontroller.

Microchip currently offers more than 60 RISC-based PICmicro MCUs, and has several dozen more in development. One key advantage not found elsewhere: "seamless" migration from one device to the next means you can quickly move up the line from the PIC12CXXX to the PIC16C5X to the PIC16CXXX and the PIC17CXXX, and find successively more performance features. Complementing the MCUs is an assortment of hardware and software ("virtual") peripheral devices. Microchip has spent the past two years hard at work honing the PICmicro MCU family to make it the logical choice over the older MCU architectures.

Programming is exceptionally easy. Microchip offers In-Circuit Serial Programming™ and user-friendly development tools, Windows-based MPLAB™ Integrated Development Environment (IDE), Universal Macro-Assembler, C Compiler, Modular In-Circuit Emulators, Modular Device Programmers, Fuzzy Logic Development software, and MP-Driveway™ application code generator.

possibilities for product design, especially because these new parts don't skimp on performance. They are RISC-based (arithmetic and logical instructions execute in 1 microsecond), and they make 6 of their 8 pins available for functionality such as LED (light emitting diodes) display control. On-board peripherals include:

- Analog-to-digital converter
- EEPROM data memory
- Power-on reset
- Watchdog timer, and more

The PIC12CXXX family has an instruction set with only 33 to 35 instructions, so learning to program these devices takes little time. When additional performance is needed, designers can seamlessly migrate their code to any of the other PICmicro devices in Microchip's line of 8-bit MCUs, the largest of which today has 84 pins.

The 8-pin PICmicro MCU Family	Program Memory (Words)	Data Memory (Bytes)		Max Speed	Pins	Peripherals				
		RAM	EE			I/O	8-Bit Timer	WDT	A/D 8-Bit	ICSP
PIC12C508	512x12 OTP	25		4MHz	8	6	✓	✓		✓
PIC12CE518	512x12 OTP	25	16	4MHz	8	6	✓	✓		✓
PIC12C509	1Kx12 OTP	41		4MHz	8	6	✓	✓		✓
PIC12CE519	1Kx12 OTP	41	16	4MHz	8	6	✓	✓		✓
PIC12C671	1Kx14 OTP	128		10MHz	8	6	✓	✓	4 ch	✓
PIC12CE673	1Kx14 OTP	128	16	10MHz	8	6	✓	✓	4 ch	✓
PIC12C672	2Kx14 OTP	128		10MHz	8	6	✓	✓	4 ch	✓
PIC12CE674	2Kx14 OTP	128	16	10MHz	8	6	✓	✓	4 ch	✓

SMART SOLUTION, SMART CHOICE

What makes a smart PICmicro solution such a smart choice? First, the far greater functionality/flexibility of the MCU compared with discrete components makes it easy to design-in performance improvements that will make your products stand out against their competition and you can earn customer loyalty with an innovative product. Second, using an MCU means better, more

Want the Power of PICmicroTM in an 8-Pin Package?



Microchip makes it for mechatronics.

Introducing the world's first 8-pin, 8-bit microcontroller—funneling the power and performance of the popular PICmicro family into a tiny 8-pin package. Now you can design intelligence into products where cost or space limitations previously made this impossible. Small personal care appliances. Remote transmitters. Lighting fixtures. Security sensors. Wherever you once thought about small gate array, discrete logic devices, or even electromechanical design, think PICmicro instead. The PIC12CXXX microcontroller family combines Microchip's high-speed, high-performance RISC architecture with extensive on-chip peripherals. Call today to request the Mechatronics PowerPak and find out how the power of an 8-pin PICmicro can make your designs smarter.



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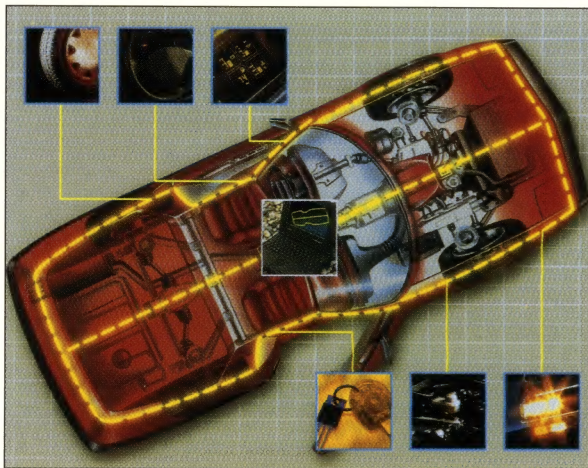
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ISO9001 certified since 1993, we have adopted TQM standards and are working towards achieving our own Philips International Quality Award.

We take pride in our delivery performance which is continually measured. Our carefully developed processes are in place to provide the highest level of quality service, such as our bar-coded warehouse, which is designed to eliminate errors.

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Operating within the framework of TQM (Total Quality Management), our product range includes ceramic capacitors, film capacitors, electrolytic capacitors, fixed and variable resistors, delay lines and filters as well as quartz crystals and oscillators.

With fifteen years' experience in the area of surface-mount technology, Philips can offer an exceptionally wide and varied surface-mount programme covering virtually all application areas. We are also active in developing multifunctional components, high-frequency filters, piezo transformers and integrated passive components (combining resistors, capacitors and inductors in a standard semiconductor package).

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applications.

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Philips leads the world in sales of the popular 80C51 8-bit microcontrollers and has the largest range of configurations and performance options, including devices operating down to 1.8V. For 16-bit applications we now have a developing range of XA (eXtended Architecture) devices, which provides a smooth upgrade path for 80C51 users.

In communications, our focus is to provide solutions for eight key segments - data communications, RF communication, line telephony, cellular and cordless telephony, portable mobile radio, pagers, satellite and multimedia communications.

In automotive, we offer solutions for systems throughout the vehicle: safety (ABS, airbag and traction control); comfort (climate control, power windows and mirrors and central locking); and engine management (diagnostics, lighting and dashboard control). Plus state-of-the-art vehicle immobilisation systems and multiplex wiring buses.

In audio and video, we have over 200 ICs for TV, video cameras, VCRs and monitors. For TV, our latest developments include Picture Quality Improvement and Picture-in-Picture ICs. As a world leader in audio processing, Philips offer a comprehensive range of DACs, ADCs, power amplifiers and a new DSP which can deliver concert hall and similar effects. For radio systems we offer products for portable and home hi-fi, and car radio systems.

Leadership in smart card ICs and systems is a vision Philips has consistently pursued in the last decade. Following this vision, Philips was the first semiconductor company to introduce a smart card controller with an on-chip crypto system. Today our latest crypto controller can perform RSA public key signature calculation in a blistering 60ms. Not satisfied with advanced high security smart card ICs, Stored Value Cards, banking and telecoms, Philips now have contactless smart card systems for Automatic Fare Collection, access control and stored value.



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Philips offer a wide range of integrated circuits and discrete semiconductors to supply the consumer market's increasing demand for versatility.

Philips have long been manufacturing quality products such as Bipolar & CMOS logic and linear industrial ICs. In recent years, Philips has offered the widest range of 3V and 5V families. The ALVT is the fastest TTL currently available with typical propagation delays of 1.5ns.

Philips supply a wide range of discrete semiconductors that stretch from small signal diodes and transistors through power rectifiers and triacs to market-dominating wideband amplifier modules for CATV systems.

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With TOPFETs, Philips introduced the first fully temperature and overload-protected discrete power MOSFETs.

Philips was a pioneer of surface-mount technology 25 years ago and we are progressively shrinking standard packages to match the needs of today's miniature, portable applications.

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Philips Components also offers a range of selected electromechanical and display products. We offer LCDs and modules (both standard as well as custom made designs), fuses, heatsinks, filters, connectors and other selected products from leading manufacturers.

A wide and innovative range of standard and discrete semiconductors



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Enquiry No. 1350



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